Cash Transfers and their effects on attendance, cognitive and non-cognitive outcomes:
Evidence from Ecuador

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Gabriela Alexandra Izurieta Ballesteros
(Ecuador)

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Members of the Examining Committee:

Dr. Arjun S. Bedi
Dr. Robert Sparrow

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Disclaimer:

This document represents part of the author's study programme while at the International Institute of Social Studies. The views stated therein are those of the author and not necessarily those of the Institute.

Inquiries:

International Institute of Social Studies
P.O. Box 29776
2502 LT The Hague
The Netherlands

t: +31 70 426 0460
e: info@iss.nl
w: www.iss.nl
fb: http://www.facebook.com/iss.nl
twitter: @issnl

Location:

Kortenaerkade 12
2518 AX The Hague
The Netherlands

Contents

List of Tables

List of Figures

List of Appendices

List of Acronyms

AFS	Associated Factors Survey
BDH	Bono de Desarrollo Humano (Human Development Bonus)
INEVAL	Instituto Nacional de Evaluación Educativa
IV	Instrumental Variable
OLS	Ordinary Least Squares
RDD	Regression Discontinuity Design
RS	Registro Social (National Registry)
SELBEN	Sistema de Identificación y Selección de Beneficiarios de Programas Sociales (System of Identification and Selection of Beneficiaries of Social Programs)
2SLS	Two stage least square

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Abstract

The BDH cash transfer is a social protection program directed to the poorest households in Ecuador. This paper examines its impacts on attendance, cognitive and non-cognitive outcomes of students that aim to pursue higher education. The data used corresponds to the Ser Bachiller data base and the Associated Factors Survey for the academic cycle 2016-2017 (one cross-sectional period). The short-term exposure to the program was evaluated building a pseudo-assignation index and a regression discontinuity design (RDD). The main results show that households that are near the assignation score (28.2) have an increased probability of participating in the program that ranges from 7.5 to 8.6 percentage points. The BDH has a positive and significant impact on school attendance of around 0.40 percentage points. For the cognitive outcomes, RDD-IV estimates reveal that the BDH cash transfer has a statistically significant negative effect on the general score that ranges from -0.34 to -0.35 points. The effect is also negative and significant for the mathematics score: a decrease of 0.37 to 0.44 points. For sciences score the effect is of -0.49 points. Regarding the non-cognitive outcomes, the BDH has a negative impact on students' academic self-esteem in mathematics - that ranges from 0.23 to 0.26 percentage points and a negative effect on academic self-esteem in language class ranging from 0.29 to 0.33 percentage points. The overall results indicate that even though the BDH motivates attendance, the effect is not translated into higher scores or better students' expectations, motivations or self-esteem.

Relevance to Development Studies

This study faces the growing theory that discusses the possible influence of cash transfer programs on cognitive and non-cognitive outcomes and the already explored relation with school attendance. The political argument for promoting cash transfers stands for the idea that these are not only money "handouts" but improve beneficiaries' well-being (Fiszbein and Schady 2009). Particularly, there are many studies that evidence how beneficiaries are sending their children to school more often (increased attendance), but, are they truly engaged with their school activities?

This study provides a holistic view of the *Bono de Desarrollo Humano* (BDH) Ecuadorian cash transfer and explores two new effects on cognitive and non-cognitive skills of adolescents. Moreover, the interesting aspect of the study is that it relates these –up to now- theoretical effects with their linking argument which is school attendance and enters as a new and interesting piece of evidence to the cash transfers literature.

Keywords

Cash transfers, attendance, cognitive skills, non-cognitive skills, poverty, development.

Chapter 1 Introduction

Poor cognitive and non-cognitive development of children may have a drastic effect on their future. The insufficiency of these capabilities limits them to achieve crucial development opportunities such as having the appropriate food intake, being healthy, having self-esteem, participating in community life or having the expected level of education. This is determinant for children growing in impoverished environments because the lack of cognitive and non-cognitive abilities perpetuates the cycle of poverty and affects the future of next generations. A variety of studies demonstrate how early childhood stimulation, constant nutritious food intake and educational opportunities have relevant benefits when children grow up such as diminished drop out of school, improved cognitive skills, better behavior and higher future expectations of quality of life (Macours et al. 2008; Walker et al. 2011; Handa et al. 2014). In this sense, early interventions for children in disadvantaged households are relevant policies as they are effective in tackling childrearing problems by letting parents provide more attention to their children's development. One of the most important social protection programs in this area are cash transfers.

Cash transfers have the purpose of breaking the cycle of poverty and reducing inequality both, by redistributing resources and through the accumulation of human capital among poor households (Fiszbein and Schady 2009:8-11). In practice, these social protection programs have the potential to combine short-term and long-term effects in poverty reduction (Oosterbeek et al. 2008:1). In the short-term cash transfers guarantee a minimum consumption level whereas in the long-term it is expected that early investments in children's education and health contributes to the accumulation of human capital[1] which will help to improve their well-being. The political argument that frames the design of such programs is the promotion of well-being policies that not only consist of money handouts to the poorest. The fact that cash transfers are targeted at certain groups of people may discourage the untargeted group to pay taxes to finance the program, however, cash transfer policies are, in part, motivated by the "altruistic motive of voters" which is a type of social contract where untargeted groups can evidence that the program changes the lives of the poorest and leads them towards good social behavior (Fiszbein and Schady 2009:10).

When children grow up in disadvantaged households, their development is affected. Their parents struggle to find additional resources; this causes that parents are not involved in their childrearing. The lack of attention to children's development causes that children grow up with inadequate health levels, low school involvement, inadequate cognitive development and lack of socio-emotional development (Mani et al. 2013; Schady et al. 2014). For instance, there is empirical evidence that reflects how poor children are less likely to believe that school is important in life and have greater behavioral problems (conduct problems) which are determinant factors for their educational outcomes (Chowdry et al. 2010). For adolescents, this has severe consequences like experiencing high levels of unemployment, low-paid jobs, and high probability of teenage pregnancy, engaging on risky situations like alcohol consumption, the use of drugs or involvement in illegal activities (Dahl 2004:7).

Recent literature on behavioral economics has contributed to the analysis of poverty reduction programs on beneficiaries' cognitive skills and behavior, with interesting findings. Cash transfers have been associated with increased social skills, improved social behavior and better expectations about future life's improvement (Fernald et al. 2010; Handa et al.

2014; Attah et al. 2016). Although there is plenty of evidence that relates cash transfers and children's -generally aged from 5 to 12 years old- cognitive and non-cognitive outcomes, there is little evidence of the effect of such transfers on adolescents' –older than 12 years old. If there is evidence that cash transfers have positive effects in different periods of time and for different outcomes, then it suggests that these programs need to be diversified according to stages of life. This improvement would strengthen the programs and assure long-term benefits.

This study analyses the impact of the BDH cash transfer program in Ecuador on adolescents' attendance, cognitive and non-cognitive outcomes. Although the study is not a long-term evaluation, the results can show if adolescents belonging in beneficiaries' households experience improvements on the mentioned outcomes. The focus on adolescents is important because it is considered that they already have developed some capabilities and are more conscious of the difference that social assistance program makes to their families (Bettinger 2010:20). Even though the transfer is a small monthly amount of $50 which represents a share of 13% of the basic salary in Ecuador for 2017 ($375), past studies of this cash transfer have shown that it has substantial effects on improving families' well-being. An important novelty of this study is the data base used which belongs to the national exam to enter higher education and the survey that students must fill before taking it.

Most of the literature about these topics works with small samples and evaluates the effects of the transfer on outcomes directly related to the objectives of the cash transfer i.e. increase in household expenditure, increase in school attendance or increased use of health centres. Though these are important, the present analysis considers that cash transfers outcomes should be measured beyond the increase on school attendance. Considering that the final aim of these programs is human capital accumulation, an evaluation of such programs on cognitive outcomes is appropriate. Furthermore, evaluating the effect of such programs on non-cognitive aspects is an additional contribution as the development of such non-cognitive aspects has been shown to be associated with various economic outcomes.

Two studies are considered as a reference for this analysis. Ponce and Bedi (2010) evaluate the impact of the Ecuadorian cash transfer program, on second grade students' cognitive achievements and found no impact of the transfer. However, these results are too premature since the data was analysed one year and a half after the program started in 2003 and they use a small sample of students on rural areas and the capital of the country which may cause biased results. Paxson and Schady (2010) perform an evaluation of the same cash transfer and find improvements on cognitive and behavioral outcomes for children and their families living in rural areas. These findings encourage the idea that beneficiaries' children may be brought up in better conditions which in the long-term may be reflected in better educated adolescents with higher expectations about their future.

1.1 Background

Cash transfer programs are a development strategy in Latin America. The first countries that implemented them are Mexico (Oportunidades) and Brazil (Bolsa Familia) in the 90s. Since then, cash transfer programs have been adopted in most countries from Latin America as an antipoverty initiative.

In Ecuador the cash transfer program is called the *Bono de Desarrollo Humano* (from now, BDH). This program aims to guarantee a minimum consumption level to improve households' living conditions and break the intergenerational transmission of poverty (Ministry of Economic and Social Inclusion 2018). Previous research about the BDH show positive impacts on school attendance and reducing child work (Oosterbeek, Ponce, and Schady, 2008; Araujo and Schady, 2006). However, these studies are performed on children in school-age from 5 to 17 years old. There is a gap for the evidence of the impact of the BDH on attendance, cognitive and non-cognitive skills of students that are looking forward a higher level of studies. This research is focused on measuring the impact of this cash transfer on attendance, cognitive and non-cognitive outcomes for students that graduate from high school.

1.2 Research question and hypothesis

This research focuses on three possible effects of the BDH on human capital accumulation. The first effect will be evaluated on attendance, the second effect will be evaluated for cognitive achievements and the latter effect will be evaluated on specific non-cognitive outcomes which is the novelty of this research. The research question is:

What are the impacts of the BDH on high school students' attendance, cognitive, and non-cognitive outcomes in the year 2017?

To disentangle this inquiry, this research departs from the argument that cash transfers have positive effects increasing school attendance and then uses a combination of theory and empirical evidence to find the channels through which cash transfers are expected to have an impact on cognitive or non-cognitive outcomes. The first hypothesis is that the BDH has a positive effect on school attendance provided that the transfer has a co-responsibility with parents sending children to school. The second hypothesis is that there is a positive relationship between the cash transfer and cognitive outcomes because it becomes an incentive for them to develop their own human capital, therefore, they might effort more in school. The third hypothesis is that BDH has positive impacts on students' non-cognitive outcomes because it is related with an improvement in family's emotional wellbeing by mitigating severe economic stress.

1.3 Theoretical framework and research methodology

This research is based on the theory of parental investment in children (Becker 1981) and argues that the poorest households depend on public expenditures for their children's development. This analysis focuses on cash transfer, social assistance programs targeted to the poorest. Moreover, the study relies on the theoretical discussion by Wolf et al. (2013) about the impact of cash transfers from the effect on parents' behavior and subsequently generational transmission to children. The main assumptions taken are that cash transfers boost beneficiaries' self-efficacy, relieve economic stress in families and act as a nudge for parents' "good" behavior towards their children's development. The analysis is focused on adolescents' behavior change, which is the final outcome after their parents' behavior change and is based on the well-being theory developed by Ryff and Singer (1996).

With this framework, the available data from the Ser Bachiller data set was enough to do both, select the outcome variables for cognitive skills and non-cognitive skills and to

recreate the BDH assignation rule (RS index). This allowed to adopt a regression discontinuity design (RDD), method that exploits the program design

The research presented some limitations. First, this study does not use the official assignation score for the BDH. Instead, it recreates the RS index with the available information. It is not possible to check how correlated the pseudo index is to the original index, but it is assumed that since the official methodology is used, that they are correlated. Second, it was not possible to check whether beneficiaries received the transfer for various periods of time which implies that the evaluation is valid for the period analysed. Third, there was a high percentage of missing information, for instance 46% of students in the sample do not declare that their parents receive the transfer or not. Notwithstanding this shortcoming, the included students in the analysis are a considerable number for the objective of this study. Finally, this is a survey that students fill before taking the exam and both (the survey and the exam score) are requisites to be admitted to any higher education institution. There is informal evidence (social media propaganda) that there are training centres to prepare students for the Ser Bachiller exam. These centres pitch themselves as places where students can develop skills and abilities to achieve a high score, moreover, students might be told how to fill the survey with "prepared answers". For example, there are questions about school quality, teachers' relation with students or students' perceptions about the acquired knowledge which might be filled with the higher levels of satisfaction with the rationale that those answers may help them to have better chances to have an admission to a higher education institution. This may bias the results because if students are told which responses they should provide on the survey then it is not their perceptions the ones reflected on the answers they provide.

1.4 Chapter overview

The analysis is organized into six chapters including this introduction. Chapter II presents the main concepts to be used, a theoretical framework which outlines the channels through which cash transfers may have an impact on cognitive and non-cognitive skills and an empirical look at some cash transfers effects. Chapter III provides a background of the BDH cash transfer program and how it is targeted. Additionally, it provides an overview of the education system in Ecuador to contextualize the evaluation. Chapter IV details methodological aspects for the outcome variables, the process to replicate the RS index and the empirical approach to find the program's impact. Chapter V shows the descriptive statistics of the data used in this research, the main results and a discussion of them. Finally, Chapter VI presents the conclusions and implications for public policy.

Chapter 2 The effects of cash transfers on beneficiaries' development

In this chapter I determine the possible effects of cash transfers on adolescents and delimit the analysis into the educational sphere. Cash transfers have different effects on the development of children and adolescents (Wolf et al. 2013:4). For instance, the effect on cognitive outcomes of social interventions that incentive school attendance are larger for children than for adolescents however, this is compensated by the development of non-cognitive skills in adolescence (Pfeiffer and Karsten 2008:15). In this sense, the effectiveness of antipoverty interventions, such as cash transfers, on adolescents depends on the alterations on their behavior. This is why it is important to analyze the possible effects of cash transfers on non-cognitive skills as much as cognitive skills.

In order to show the importance of this argument, I first review some theoretical discussions around the cognitive and non-cognitive development of individuals since childhood to adolescence. This conceptual framework is then related with channels that depict how cash transfers programs may cause a change in cognitive development and how they may influence non-cognitive development. I use Wolf et al. (2013) theoretical discussion and analyze the possible pathways of influence. Finally, I include some empirical evidence that shows how cash transfers can have an effect in school attendance, an impact that has already been evidenced, and also on cognitive and non-cognitive outcomes. I differentiate these effects for children and adolescents.

2.1 Human capital accumulation and skills development

Human capital accumulation is conceived as the various forms of investments that improve people's skills and capabilities throughout the time. Examples of investments on human capital are education, medical care, mobility, resources and mental health which in the long-term facilitate individuals' productive activities and provide returns such as earning a good salary, improved health or having a satisfying job (Becker 1993). These elements become part of the person that receive them, and their consequences are forms of capital. For this reason, these forms of investments can be treated as human capital (Schultz 1960:1).

Human capital is composed of cognitive and non-cognitive skills (Pfeiffer and Karsten 2008). On the one hand, cognitive skills allow an individual to "understand complex ideas, to adapt effectively to the environment, to learn from experience, to engage in various forms of reasoning, to overcome obstacles by taking thought" (Neisser et al. 1996:77). The set of cognitive skills are acquired according to individuals' development throughout time. They are sensory-motor, representational and abstract skills which depend on acquired and recombined habits and associations from interactions with the environment. "As cognitive development progresses, infants first control variations in their own sensory-motor actions, then children control variations in their own representations, and finally adolescents or adults control variations in their own abstractions." (Fisher 1980: 481). On the other hand, non-cognitive skills are related with personality traits, patterns of thought, feelings and behavior (Borghans et al. 2008). Other aspects that the non-cognitive skills include are preferences, motivation, sociability, emotional stability, cooperation, consistency of interest, persistence, teamwork, risk aversion, self-control and decision making among others.

Neurobiology studies have found that the formation of cognitive skills such as intelligence, memory power and reasoning is more relevant in early life and it declines in adulthood (Pfeiffer and Karsten 2008:2). Conversely, non-cognitive skills are built to a greater extent during adolescence. Dahl (2004) provides neuroscientific evidence that prefrontal cortex (linked with personality, behavior, self-regulation and emotions) malleability is possible till the early 20s. However, both skills are compensated between each other over time. This heterogeneity in skills formation also accounts for endowments over lifecycle such as investments made on education and the ability to traduce them into skills.

2.2 Cognitive, non-cognitive skills and poverty

Becker's theory about parental investment on children argues that "parents influence the economic welfare of their children primarily by influencing their potential earnings" (Becker 1981:242). This means that family income influence children's development as it can be destined to send them to school, buying books, social and cultural capital, leisure time or to destine more time to spend with them (Wolf et al. 2013). Therefore, human capital accumulation depends on the investments made during childhood. In this context, Becker (1981) proposes a model for adult human capital and expected earnings:

$$H_t = \Psi(x_{t-1}, s_{t-1}, E_t) \text{ with } \Psi_j > 0; j = x, s, E \quad (1)$$

Equation (1) shows the human capital production function H_t and is integrated by endowments inherited from parents (E) and by parental expenditures (x) on children's skills, health, learning, motivation and public expenditures (s) on their development (benefits). Families with sufficient economic resources can face optimal investments for their children however, disadvantaged households face financial constraints and depend highly on the amount of public expenditures.

The lack of resources force families to limit expenditures on children's healthcare, nutrition or education which has harmful effects on their cognitive and non-cognitive development (Becker 1981). Complementing the analysis made by Becker, Conger (2007) reflects on the idea that parents have a strong influence on children's wellbeing because of family stress and family investment on children (social causation model) and the non-economic parents'-positive-characteristics like good health, cognitive abilities, persistence or reliability that motivate children (social selection model). This theory describes the interactions between children's development, family processes and poverty.

Family stress framework denotes a relation between poor socioeconomic status and economic pressure on families. The complexity of tackling problems as unmet material needs (adequate food and clothing), the incapacity to pay bills, the inability to distribute the available resources and having to cut necessary expenses (health insurance and medical care) has a psychological link with economic distress (Conger 2007: 179). The persistent mental interruption and the inappropriate health condition makes it difficult for individuals to engage in their cognitive development (Mani et al. 2013). For instance, evidence in the field of neurocognition and physiology shows how constant exposure to chronic stress leads to higher levels of allostatic load (the wear and tear on the body) which contributes to physical morbidity and influences neurological processes (disruption of cognitive functioning) (Evans and Schamberg 2009). The investment framework establishes a relation between economic resources and how poor families have to spend on immediate needs rather than in human capital development such as learning material, training, living standards or education (Conger 2007: 181).

Social selection explanation counterbalances the previous idea and states that no matter the economic deprivation of parents (social causation), if they have good cognitive and non-cognitive characteristics (genetic endowments and values that may be transmitted to their children) and good parenting skills, they will overcome economic stress or dissipate it.

In this sense, there is a key importance of government' programs that help to increase available resources of families living in disadvantaged socioeconomic conditions. Indeed, social protection programs are one of the possibilities that help to increase available resources of families living in disadvantaged socioeconomic conditions, because as argued previously children from disadvantaged households highly depend on public expenditures for their development. The social protection programs that I analyze are cash transfers. As it is known, the aim of these programs is to break the cycle of poverty in the long-term by fostering children's human capital accumulation[2]. This objective is achieved with a series of factors that affect the development of children throughout time. Cash transfers can be conditioned: beneficiaries have to comply with requirements after receiving the transfer such as sending children to school or periodic visits to health centers; or they can be unconditioned.

2.3 Cash transfers and hypothetical channels that affect cognitive and non-cognitive skills

In this section, I will propose possible channels through which cash transfers influence beneficiaries of such programs. The analysis is based on the theoretical discussion of Wolf et al. (2013) about the mechanisms of change of cash transfers where parents are the mediators of child development processes. One of the crucial psychological arguments surrounding the discussion is the self-efficacy theory. Self-efficacy is defined as "people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives" (Bandura 1994:2). With this context, cash transfers are a positive incentive that promote self-efficacy of beneficiaries, argument that will be explained below (Wolf et al. 2013:10). In addition, the change in -older- children's behavior can be analyzed with the help of some concepts from the wellbeing theory by Ryff and Singer (1996). Ryff´s wellbeing theory was developed to describe adults psycosocial behavior and has been widely used to examine adolescents' wellbeing (see for example Emadpoor 2016; Gao 2018; Casullo and Solano 2000). Adolescents' wellbeing constitutes the final outcomes of the cash transfers and are important skills for their further development.

As it was described previously, families living in poverty conditions experience high levels of stress trying to find sources to finance their basic needs. This psychological state determines both, cognitive capacity and positive behavior i.e. people that do not have high levels of stress tend to have better performance in those aspects (Bandura 1997). Parents that experiment high stress levels, tend to have bad parenting skills and problems engaging in positive behavior (Gershoff et al. 2007). When families receive a transfer, household disposable income changes. This allows parents to consume more or invest in other necessary aspects, for instance, on their children's education. In this sense, cash transfers give beneficiaries financial autonomy which is an opportunity to them to master their environment[3]. Then, stress over economic constraints is reduced or relieved. When household members experiment less stress, they can engage in other activities; parents might be more conscious of their children's necessities and give them more attention. Family involvement in children's education causes them to feel more motivated, confident and autonomous which leads to an improvement in their locus of control (Skinner et al. 1998) which is an attribute that reflects

if a person believes that they have the control over the consequences of their acts. When children with high locus of control become adolescents, it is most likely that they are more conscious about the decisions they take. Additionally, better parenting practices is a channel for children to have better socially competent behavior (e.g. positive relations with others[4]) and improved mental health (Gershoff et al. 2007).

For people living in poverty, their motivation to overcome that situation is an important feature. One of the main points made by Wolf et al. (2013) and is explained on this study is that an incentive like a cash transfer may boost beneficiaries' self-efficacy[5] because it makes them conscious about their situation, it improves it and beneficiaries may be more motivated to persevere in the face of the adverse condition they live in. A person with high self-efficacy has higher aspirations, sustained effort and longer persistence; moreover, it is possible that children's self-efficacy is originated on parents' self-efficacy (Wuepper and Lybbert 2017:397)

When children see that their parents are working hard to improve their living conditions, they might realize the importance of the social aid they are receiving: they may value the change in their economic situation (an improved self-acceptance[6]) and their parents' optimistic attitude towards poverty (social persuasion). This can motivate children when growing up who may be willing to improve their situation by looking for a higher level of education or better income sources (purpose in life[7]). The willingness to improve their constrained condition helps them to be more involved in their education (personal growth[8]). However, children and adolescents living in poor households tend to be more realistic and even if they do not participate more in class, they might be working harder than the ones that are not receiving the social aid (Wolf et al. 2013). Motivation plays a fundamental role in school achievement because students that have positive attitudes towards hard work along with perseverance might be more persuaded to put all their effort on tests and school work (Borghans et al. 2008). These set of characteristics are part of the perceived self-efficacy which in this context empowers beneficiaries' children to perform better in school.

In addition to the reduction in family stress and the boost on beneficiaries' self-efficacy, some cash transfers represent a nudge on parents' behavior because they are usually are issued with a series or requirements or conditionalities. The most common conditionalities are sending children to school and visiting health centers periodically. When parents are demanded to send children to school, they may be more aware of the importance of their children's education. They may be more involved on their educational process (Wolf et al. 2013). Besides, parents may make additional efforts to send children to school with the appropriate clothing and school material which increases both, children's self-esteem and their perceptions of respect and inclusion (Dercon and Krishnan 2009).

In addition, beneficiaries might have the fear of losing the transfer if they do not use it in the proper way. This acts as an external regulation on the basis of rewards and punishments which reinforces beneficiaries' behavior towards the transfer. Therefore, cash transfers act as extrinsic motivations[9] on parents' *good* behavior which is the basis of the subsequent analysis.

The described changes in children's behavior have a positive effect on their well-being. Comparing the present theory with other theories used to evaluate the impact of cash trans-

fers on cognitive and non-cognitive skills (UNICEF 2012; Bastagli et al. 2016), this conception considers the impact starting from the effect on parents' behavior and then a generational transmission to children which is a more accurate approach.

2.4 Empirical aspects: cash transfers and attendance, cognitive, non-cognitive effects

There are important pieces of evidence that show how cash transfers, in addition to having effects on school attendance, are related to changes in cognitive and non-cognitive outcomes. When students attend school, dropout rates are expected to decrease, and more children will be able to complete education levels. Time spent learning and effort in school are important predictors of cognitive performance (Yaqub 2002:1084). Then, a higher education levels incentive the development of cognitive abilities and non-cognitive abilities which is translated into higher productivity and improved social and economic conditions in the long term (Heckman et al. 2006:8).

For instance, Duncan et al. (1994) demonstrate how a low family income is highly correlated with children's, between 0 and 5 years old, cognitive and non-cognitive development. They find that this relation dominates other variables commonly related to children's development such as maternal education, ethnicity and female headship. Furthermore, they find that poverty effects are cumulative, however, they claim that their results do not prove that increases in poor families' income improves child outcomes. Dahl and Lochner (2005) prove this aspect. The authors focus on children between 8 and 14 years old and find evidence that increases in family income are associated with an effect on test scores (mathematics and reading) and behavioral measures which supports the idea that income transfers to poor families can help to boost their cognitive and non-cognitive development. Is this argument the case of cash transfers?

Gneezy et al. (2011) cash transfers work as extrinsic incentives to beneficiaries that are expected to give parents and additional effort to take children to school and give them a better education. This may to boost students' motivation. However, they argue that empirical evidence supports three main findings:

1. Extrinsic incentives increase attendance and enrolment.
2. They have mixed results on school achievement and effort (cognitive and non-cognitive outcomes).
3. Extrinsic incentives have varied effect for certain groups of students (e.g. children and adolescents).

In the case of conditional cash transfers, the first type of findings is an expected effect because the programs are nudging parents with the conditionality on attendance which is only a proof of the effective implementation of the programs (Handa and Davis 2006:518). However, when the conditionality relies on educational outputs, as better school achievements (linked with the second type of findings), monetary incentives seem to be less effective compared with incentives conditioned on educational inputs (school attendance), because students find it hard to turn their efforts into success (it also depends on their ability and motivation) (see Gneezy et al. 2011; Bettinger 2010). The studies discussed below reflect these three types of findings and are focused on differences between children and adolescents in terms of attendance, cognitive skills and non-cognitive skills.

Behrman et al. (2005) find interesting effects by age groups of the cash transfer *Progresa* in Mexico. When the authors disaggregate the data, they find that the program participation has a negative effect on grade repetition (a decrease) and a improved school progression for children that are 6 to 10 years old. On the other hand, for older children aged from 11 to 14, the program decreases the dropout rate and motivates school reentry for the ones who dropped school previously. A similar result was found by Angrist et al. (2006) who evaluate the impact of secondary school vouchers in Colombia. They followed up a group of students that applied for the transfer in two occasions. On average, they were 13 years old the first time and 17 years old the second time. The authors find that the students that won the voucher have higher graduation rates from high school which suggests that the program is an incentive specially for the students at risk of repeating a school year.

Baez and Camacho (2011) evaluate the long-term effect of the *Familias en Acción* conditional cash transfer in Colombia and find that that students that received the transfer for a longer time were more likely to graduate from high school (the probability is higher for girls and students in rural areas). However, students do not have higher scores. As the authors enlighten, the non-correlation between attendance and better school performance may be explained by the fact that if attendance increases then schools may get congested and then class-rooms will be overcrowded. The attention that teachers provide to each student is affected and that can cause academic deficiencies. Other possible reason is that children in poverty conditions might feel less motivated and might have less capacity to improve their school performance.

Fernald et al. (2010) evaluate the effects of the Mexican cash transfer program *Oportunidades* on cognitive development, language ability and behavior problems. After 10 years of the program's implementation, they did find a decrease in emotional problems, bad conduct and hyperactivity disorders. The study relates this finding to improvement in parents' mental health and the increase in family interactions caused by the reduction in economic stress. Additionally, they find evidence that the continuous receipt of the transfer is associated with higher verbal abilities, cognitive scores and reduced behavioral problems. This is closely associated with the improvement in psychological wellbeing of family members caused by the alleviation on feelings of financial strain and deprivation which was discussed on the previous section.

Results on non-cognitive outcomes are varied. The same cash transfer program *Oportunidades* was evaluated by Ozzer et al. (2009) with a quasi-experimental evaluation in children's behavior between 4 and 5 years old. They conducted a survey about children behavior problems on mothers and find a 10% decrease in aggressive/oppositional symptoms and no effect in anxiety/depressive symptoms. Another example is the study by Handa et al. (2014). The authors analyze the impact of a Kenyan cash transfer that encourages school retention of children. Specifically, they evaluate inter-temporal choices, risk aversion, quality of life, future well-being (in one, three and five years) and subjective future risk assessment (likelihood of a certain event would happen in the near future). Although the authors did not find effects of the program for the first two outcomes, they found that the cash transfer has positive effects on beneficiaries' expectations about their life's improvement in the future. They also found that beneficiaries feel happier and more positive about their future and their quality of life, an important impact related with their self-acceptance, environmental mastery and overall, with their self-efficacy.

Attah et al. (2016) provide evidence of how a cash transfer program can have effect on beneficiaries' well-being. They assess the impact of cash transfers in Kenya, Ghana, Zimbabwe and Lesotho with a mixed method evaluation on beneficiaries' psychological wellbeing (framed by the theory of Ryff and Singer 1996). What the authors find is the presence of a self-reinforcing cycle that parts from the cash transfer and is followed by increased self-esteem, social integration, interactions and development outcomes that boost their self-efficacy. For instance, they bring to light that children (aged 6 to 17) value the fact that they were able to use clean clothing, to pay school fees and study material which allowed them to increase their self-acceptance. They found that cash transfers influenced the improvement relations with teachers and classmates (diminished stigma from teachers), their autonomy increased because their performance only depended on their hard work and no other economic concerns which helped them to master over their environment. School performance was evidenced in Kenya derived from these results; while in Ghana, Zimbabwe and Lesotho the cash transfer gave them hope about improving their condition and beneficiaries were more self-reliant. It also helped them to be active participants in social life (self-acceptance) and the confidence to cope with their reality.

Chapter 3 The BDH cash transfer and the education system in Ecuador

In this Chapter I provide a background of the BDH cash transfer program and describe the assignation rule. Afterwards, I show some empirical evidences that motivates this research. In addition, I describe the Ser Bachiller process and the ASF information I used in this analysis.

3.1 The BDH transfer program in Ecuador

The BDH was created in 2003 as part of a restructuring of two social assistance programs: Bono Solidario and Beca Escolar.

The Bono Solidario was an unconditioned cash transfer program for low-income families created in 1998. It was an instrument of monetary compensation for the economic crisis in those years and because gas and electricity subsidies were eliminated. The Bono Solidario was issued mainly to female head of households with at least one child under 18 years old, no formal job and a monthly income of less than 1.000.000 Ecuadorian Sucres-approximately $40. Beneficiaries received a monthly transfer of 100.000 Ecuadorian Sucres- approximately $4 (Martinez 2016, no page).

The *Beca Escolar* was a conditional cash transfer program created in 2002. The transfer was intended for families living in extreme poverty and indigence with the condition that families keep children, between 6 and 15 years old, in school. In addition to being enrolled in an educational institution, children must attend at least 90% of the total classes in a school year, otherwise the transfer was removed (Martinez 2016, no page).

In 2003, the government decided to change the *Bono Solidario* program into the *Bono de Desarrollo Humano* conditional[10] cash transfer. This reform also improved the selection mechanism by creating the System of Identification and Selection of Beneficiaries of Social Programs (SELBEN) which stablished a welfare index, called the SELBEN index. The index is constructed on the basis of information gathered through a living conditions survey that includes social, economic and demographic information for each member in the household. The new transfer was directed to households in the first and second poorest quintiles according to the SELBEN index. The monthly amount was raised to $15 and was directed mainly to mothers (Martinez et al. 2017:7-8) which represented a share of 10% of the basic salary in Ecuador for 2003 ($138).

3.1.1 The BDH assignation rule

Initially, the allocation of the BDH was based on the SELBEN Index, however, the assignation rule has changed two times. The SELBEN index was calculated using non-linear principle components and was based on a combination of a set welfare variables that covered information related to housing characteristics, access to services, availability of goods, family composition and levels of education, among others. With this technique, the variables are combined and weighted i.e. each category of each variable has a weight depending on welfare standards. The better is the characteristic denoted by the variable category, the higher the

weight assigned for the category and therefore, the better the achievement in that variable. The total score is the combination of the achievements on each of the variables and it ranges from 0 to 100 which is the highest welfare level. The assignation rule in 2003 included quintiles 1 and 2 of the income distribution (Martinez et al. 2017:7-8).

The transfer allocation mechanism with the SELBEN index was modified in 2009. A cutoff score was stablished as an approximation of the national poverty line. In that year, the National Social Registry was created with the objective of having a registry of households and family members with their corresponding identification numbers and socio-demographic information. This data base must be updated every five years on the basis of a survey. Additionally, the Social Registry allows the inscription of new beneficiaries if there are families that want to register and meet all the conditions. The cutoff score for the SELBEN index II was fixed at 50.65. This means that eligible households were under that line. Additionally, in this year the monthly transfer increased to $35, which represented a share of 16% of the basic salary in Ecuador for 2009 ($218). The latest change in the cutoff score was in 2014 as an approximation to the extreme poverty line. The information in the National Social Registry was also updated. The new welfare measure was called RS index and it was estimated with 34 variables (Ministry Coordinator of Social Development ca. 2014). The cutoff score was stablished at 28.2 and the monthly transfer was raised to $50, which represents a share of 13% of the basic salary in Ecuador for 2017 ($375) (Martinez et al. 2017:7-8).

Table 3.1 presents the changes that the BDH assignation rule has experienced since its creation. Given these changes is complex to have a follow-up for each household i.e. there might be beneficiaries included in one of the periods and excluded in other periods.

Table 3.1
Changes on the BDH assignation rule and characteristics

Year	Amount received	Criteria of assignment	Cutoff score
2003	$15	lowest 40% (first and second poverty quintiles)	-
2009	$35	Proxy of poverty line	36,5
2013	$50	Proxy of extreme poverty line	28,2

Source: Martinez et al. (2017).

3.1.2 Human capital and the effectiveness of the BDH in Ecuador

Empirical evidence shows that BDH cash transfer has an immediate positive effect on investment in education (Ponce, 2008; Edmonds and Schady, 2012), household disposable income (Mideros and O'Donoghue, 2014) and and beneficiaries' nutrition (Ponce, 2008; Schady and Rosero, 2008).

Research on educational outcomes demonstrates that the BDH has positive and significant results on children's school enrollment and attendance, that is, parents not only enroll their children in a school but they also make sure of sending them periodically. Evidence by Oosterbeek et al. (2008) shows that the program increases school enrollment only for the first quintile of the poorest households which means that the program helps to solve finantial constraints but not for the ones near the threshold-the first version that included households in the first and second poorest quintiles according to the SELBEN index. Schady and Araujo (2006) provide evidence on the basis of a randomized experiment

of poor children in five provinces. They find a large and positive impact of the BDH on school attendance and a significant decrease in child work. Rosero and Martínez (2012) claim that the effect on school attendance is even bigger for households that take conditionalities as mandatory. In addition, Edmonds and Schady (2012) provide evidence that students from BDH families -aged between 6 and 17- reduce their involvement in economic activities because parents postpone their decision to send their children to work when they start receiving the transfer.

Claiming that the focus on enrollment and attendance is not enough to ensure that students are developing their human capital, Ponce and Bedi (2010) perform a short term study of the impact of the BDH on cognitive outcomes of students in second grade. They used the score of standardized test scores in mathematics and language to measure the program's effect, however, the authors found no significant impact. Paxson and Schady (2010) did a related research about the impact of the BDH program on children's development living in rural areas. The authors test two types of outcomes: cognitive skills and social development measured by the Behavior Problems Index. The findings show null results for the whole sample but there are important effects on the poorest children: they have better cognitive and behavioral outcomes compared with the children that do not receive the transfer.

A more recent evaluation by Araujo et al. (2017) measures the effect of the BDH after 10 years of its implementation. They study the impact on school attainment, learning outcomes and employment status of young adults around 25 and 28 years old. What they found is that cognitive outcomes measured by total scores and language, math scores are not improved in the long term. There is a small effect of the transfer on school attendance and a positive effect for secondary school completion, specially for girls. Nonetheless, the BDH effect was null for the probability of attending a higher education institution or labor status.

Based on the empirical evidence on the effect of the BDH, particularly on educational outcomes, there is a need to show the effect of the program for older children. The positive results of the program in children opens the question about whether the effect is also positive in adolescents, an age group that is important because they have greater autonomy specially with respect to their education. Beyond school attendance, this research focuses on cognitive and non-cognitive outcomes (which may be driving cognitive outcomes). This goes by the hand with the reform of the Ecuadorian education system in recent years focused on improving quality and effective learning of students which is an improvement of the previous process that was focused on educational coverage and the elimination of illiteracy (National Institute of Educative Evaluation 2016:9).

3.2 Education System in Ecuador

The Ecuadorian education system aims to provide students interdisciplinary preparation to guide them in the development of their life projects and integrate them into the society of *Buen Vivir*[11]. To accomplish these expectations, the last educational levels[12] empower students with learning and citizenship skills that allows them to take an active role in the economic situation of their families or continue with their education (Executive Function of Ecuador 201:23). These goals are permanently monitored trough a variety of process however, due to the objective of this research, it will focus on the process that evaluates students that aim to face higher education studies: the Ser Bachiller exam.

The Ser Bachiller exam evaluates the development of the skills and abilities that students that graduate from high school. The evaluated features are necessary for successful development as citizens and to face higher education studies (National Institute of Educative Evaluation 2017:1).

3.2.1 Ser Bachiller exam

In 2013, the National Institute of Educative Evaluation (INEVAL) implemented the learning assessments exams *Ser Estudiante* and *Ser Bachiller*[13]. The first one is an exam for students in fourth, seventh and tenth grade of basic education and it is directed to a representative sample of students. The *Ser Bachiller* exam is directed to students who finish high school and want to pursue higher education. It is a census of students and it is mandatory since 2014. The exams are applied at the end of each school year. In Ecuador, the Costa region (beachside) finishes the school year in February whereas the Sierra and Amazon regions finish in June, therefore there are two yearly rounds of each exam.

The Ser Bachiller standardized exam evaluates basic knowledge areas: mathematical domain, linguistic domain, scientific domain and social domain. The mathematical domain contains problems related to the choice and use of operations to determine unknown values in different contexts of daily life, data interpretation and pattern analysis. This domain reflects the student's ability to understand complex problems, apply a high reasoning level and develop ideas to find a solution to them. The linguistic domain assesses the understanding of the meaning of words and phrases, formal aspects of the language and the understanding of literary and non-literary texts. This domain shows how well students understand the formal aspects of language. The scientific domain evaluates the student's abilities in subjects of ecosystem elements and processes, links between physical-chemical mechanisms and the conservation of natural resources, the interaction of life systems and the dynamics between matter and energy. This is a domain that evaluates how the students relate environment with the concepts learned in school and their understanding of the various complex physical and chemical processes that happen in interactions between systems. The social domain examines the elements that make up a society (history and culture) and identifies the aspirant's citizenship skills in their interaction with the world. The module reflects how the student is adapted to its own environment and is conscious about social and ecological problems.

The exam has a total of 155 items (with different weights according to difficulty, complexity and cognitive operation levels). Out of them, 120 items address specific knowledge and skills whereas 35 items belong to fluid knowledge (abstract reasoning). The exam lasts 180 minutes for all the students expect for students with hearing impairment, visual and intellectual disabilities who have a limit of 240 minutes. The total score ranges from 0 to 1000 points which are ranked into four categories: insufficient level (from 400 to 699 points), basic level (from 700 to 799), satisfactory level (from 800 to 949) and excellent level (from 950 to 1000) (National Institute of Educative Evaluation 2017).

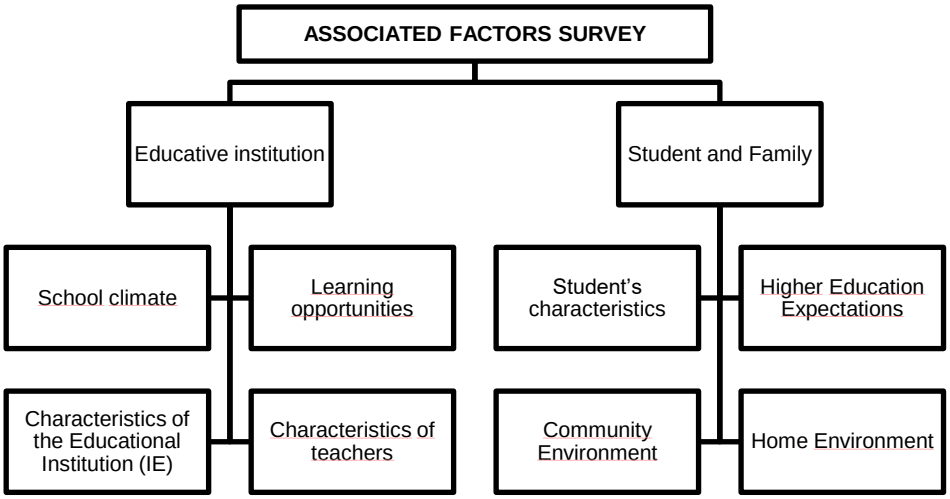
3.2.1 Associated Factors Survey

Before taking the Ser Bachiller exam the students have to fill the Associated Factors Survey (AFS) that addresses socioeconomic context, study habits, school climate, expectations of study, family support among other topics. The structure of the survey is presented in Figure 3.2. The questions are classified according to two environments that affect students' learning: inside the educative institution and outside of it. Inside the educative institution level, there

are four sublevels that are associated with students' learning. Outside of the educative institution level there are sublevels related with the interaction of students with their families, the community and their own expectations about further education.

All the questions reflect perceptions of the students about the eight sublevels; most of them require the students to indicate their degree of agreement with certain affirmations based on a Likert scale where 1 indicates "Never", 2 for "Almost never", 3 for "almost always" and 4 indicates "Always".

Figure 3.1
Associated Factors Survey structure



Source: AFS 2017.

Elaboration: the author

The periodic report about educational results in Ecuador (National Institute of Educative Evaluation 2016) reveals that the students that have higher scores on the national exam for applying to higher education Ser Bachiller, have better expectations for the level of studies they would like to achieve in the future compared to the ones that had a lower score i.e. study expectations are associated with the level of effort in school. Other findings are that the majority students that do not work have higher scores compared to students who report working and that there is a close relationship between the levels of student achievement and the level of education of their parents.

3.3 Motivation

Following the argument of Ponce and Bedi (2010), not only school attendance matters, but also that students learn and feel motivated to continue developing their human capital. This is aligned with the new focus of the education system in Ecuador which aims to develop learning skills accompanied by welfare within a framework of equality of opportunities (National Institute of Educative Evaluation 2016:14).

The poorest households highly depend on public expenditures for their children's development (Becker 1981). This argument is a motivation to analyze the role of the Ecuadorian cash transfer program, the BDH. Most BDH evaluations on the educational sphere, surround the program's intended outcomes like school enrollment, attendance or child labor and are focused on children. There is the need to look further and examine if this intervention is motivating beneficiaries to develop their human capital. For this reason, there is a

particular interest on cognitive and non-cognitive skills. In addition, this research aims to give a closer look to students that finished high school and want to attend a higher education level and are benefited with the cash transfer. As Dahl (2004) argues, adolescence is the life stage when both skills (cognitive and non-cognitive) are fully developed.

Chapter 4 Methodological approach

4.1 Data characteristics

This research aims at assessing the impact of the BDH cash transfer on students' cognitive and non-cognitive outcomes. To achieve this objective, I used the database of the National Higher Education Exam Ser Bachiller for the year 2017 (one cross section). This database contains information on students' general characteristics such as sex, geographic area, type of school they attended, their exam score and the students' answers on the AFS on each topic detailed on section 3.2.1. In addition, it contains information about living conditions which was used to build the RS score (assignation rule)[14]. This analysis used the latest assignation rule in 2013 (28.2).

It was necessary to verify that the parents of the students are the ones that received the transfer and no other family member such as grandparents, aunts, uncles or the student itself. For this end, two filters were applied. The first filter was used for the variable that indicates who is the head of the household. The selected cases were when the students declared that the head of the household is either his/her mother or his/her father. The second filter was used for the variable that indicates whether the students have children of their own: the students that declared to have children or are expecting one were excluded to guarantee that the student is not the one receiving the transfer. This is also an approach to isolate the effect of the cash transfer from beneficiary parents to their children. The last filter is the students that reported to be from 15 years old to 19 years old; birth dates that are considered valid[15].

The selected students are only Ecuadorians who took the exam for the first time and have a score. With these specifications, the Ser Bachiller data base has 92.367 students, however, the number of observations changes depending on how many students answered each of the questions that were used. For instance, there are groups of questions that had more than 50% of missing values.

4.2 Outcome Measures

The attendance, cognitive and non-cognitive outcomes used in the analysis come from the Ser Bachiller exam score and the AFS for the year 2017.

4.2.1 Attendance

The variable for school attendance was approximated from the survey information. On the section of students' characteristics, the students are asked to select the frequency with which they miss classes for a complete day during the last month of classes. The response options are: 5 or more times, 3 to 4 times, 2 to 3 times 1 to 2 times and never. To compute the school attendance, only the last option was considered to build a binary variable where 1 is assigned for the students that answered that they are never absent and 0 otherwise.

4.2.2 Cognitive skills: Ser Bachiller exam score

The cognitive outcomes are measured used the Ser Bachiller standardized exam results. The general score assigned for these outcomes ranges from 0 to 10 and it is equivalent to the official score that ranges from 0 to 1000. The other four specific scores include the basic knowledge domains: mathematical domain, linguistic domain, scientific domain and social domain.

4.2.3 Non-cognitive skills: AFS

One of the challenges of this analysis was the non-cognitive measurement. Previous studies examining the relationship between non-cognitive skills and children's development use indicators that are already part of previously defined and validated scale. For instance, in Chapter II the Ryff and Singer (1996) well-being theory was used to describe changes in children's behavior when their parents receive the cash transfer. This well-being theory has its own validated scale constructed with specific groups of questions that were tested to reflect each dimension. The pitfall of applying this approach is that the questions on the AFS are not the same to the official questionnaire used to build Ryff's well-being scale. The questions in the AFS were not developed to measure a previously defined non-cognitive construct. Instead, they were developed to contextualize the characteristics that are important for students' development and are related to their cognitive achievements.

To solve this challenge, one of the possibilities was to develop an adaptation for one of the already existing scales with the available questions. This approach requires that the proposed scale needs to be tested for internal consistency, reliability, and construct validity (Opree et al. 2018) so that it can be claimed that the final index effectively measures non-cognitive concepts. This approach was out of the scope of the current study however, it can be applied in further research.

The other option was to perform a principal component analysis to define the main groups of variables that are correlated and could define non-cognitive skills. However, there is no methodological approach to score each component and compute them as an outcome and more importantly, this approach does not consider the heterogeneity of each of the questions entering the analysis.

For this reason, a relatively straight forward option was used. The variables were selected based on the literature review about non-cognitive in Chapter II. Three dimensions were selected: self-efficacy, academic self-esteem and expectations about higher education because they are more related with the type of questions on the survey and all of them were mentioned in Chapter II as a possible effect of the cash transfer.

The indicator for the self-efficacy dimension comes from the response on the self-reflection of the student to the question: "I always feel that the acquired knowledge motivates me to investigate more, develop new ideas and put them into practice". This question is important because it captures the perception of the students about their non-cognitive capacity.

For the second dimension, the academic self-esteem, a relatively straight forward approach was followed to identify the indicators. In this case, the indicators selected were the

response to the statements "I consider I am an excellent student in X class". For the third dimension on expectations, the variable selected is part of the sub-level of "Higher Education Expectations" on the survey where students reflect on the maximum level of studies that they expect to achieve. For this question the options were: 1) I don´t know, 2) Baccalaureate, 3) Technical or Technological, 4) Superior or Third level (University), 5) Postgraduate: master's degree and 6) Postgraduate: doctorate. The level chosen is master's degree because it is the level after the level they are applying with the exam (third level). Table 4.1 displays the non-cognitive outcomes used in this research with the corresponding questions in the survey. Each category constitutes a non-cognitive outcome that will be examined. In total there are six non-cognitive outcomes.

Table 4.1
Selected non-cognitive outcomes

Dimension	Survey statement	Type of answer
Self-efficacy	I feel that the acquired knowledge motivates me to investigate more, develop new ideas and put them into practice	Yes/No
Academic self-esteem	I consider I am an excellent student in mathematics class	Yes/No
	I consider I am an excellent student in language class	Yes/No
	I consider I am an excellent student in sciences class	Yes/No
	I consider I am an excellent student in social studies class	Yes/No
Students' expectations	What is the maximum level of studies you would like to achieve? Master's degree	Yes/No

Source: AFS 2017.

Elaboration: the author

The limitation of the approach used to measure the non-cognitive outcomes is that it is possible to infer conclusions only for the relation of each specific variable and the cash transfer i.e. it was complex to build a condensed non-cognitive index. Another potential limitation is that a technical variable selection approach was not used. The selected variables are of interest considering the theoretical review although it could be that there are other questions that best describe certain non-cognitive dimensions. Finally, the number of non-cognitive outcomes is a disadvantage for a deeper analysis for each result. This could have been easier with one outcome that includes all the variables (an index).

Nevertheless, the weaknesses of this analysis are also its strength considering that the survey has many different variables that provide interesting information. The possibility to measure the impact for some of them is an opportunity to distinguish effects of the transfer on specific topics.

4.3 RS replication: the pseudo-RS index

As discussed on section 3.1, participation in the BDH program is linked to the RS index that is generated from the information in the National Social Registry. For this analysis, I created a pseudo-RS index with the available variables in the Ser Bachiller database and assigned a score to each student[16].

The original RS index was created with 34 welfare variables. The available database allowed the replication of 21 variables. To replicate each variable, I looked for the same variables (or as similar as possible) of the original methodology in the Ser Bachiller database. After verifying this, I compared each category (of each variable) with the categories of the original

variables so that they have the same number of categories and the same codification (i.e. 1, 2, 3, etc). If the variables had different codification, I recoded each category by variable in accordance to the categories of the original variables of the RS index. This step was necessary so that the original weights (available for each of the variables that generate the RS score) could be assigned to the variables in the dataset. For example, the RS variable - Level of instruction of the head of household has 4 categories: 1-None or Literacy centre, 2-Primary education, 3-Secondary education, 4-Higher education and the corresponding weights range from 0 to 3,75 correspondingly. The available variable in the data set about the level of instruction of the head of household has 11 categories which were recoded to match the 4 categories of the original RS variable. After that, I assigned the original weights and constructed the total RS as a summation of the 21 variables as is denoted by equation (2):

$$RS = \alpha + \sum_{i=1}^{21} \beta_i X_i \quad (2)$$

Where *a* is a constant term (known from the methodology), β are the original weights and *X* are the set of replicated variables. This assured that the pseudo-RS index that was built approximate as possible to the original index. Appendix 1 provides more information about the variables and methodological aspects while replicating the RS index.

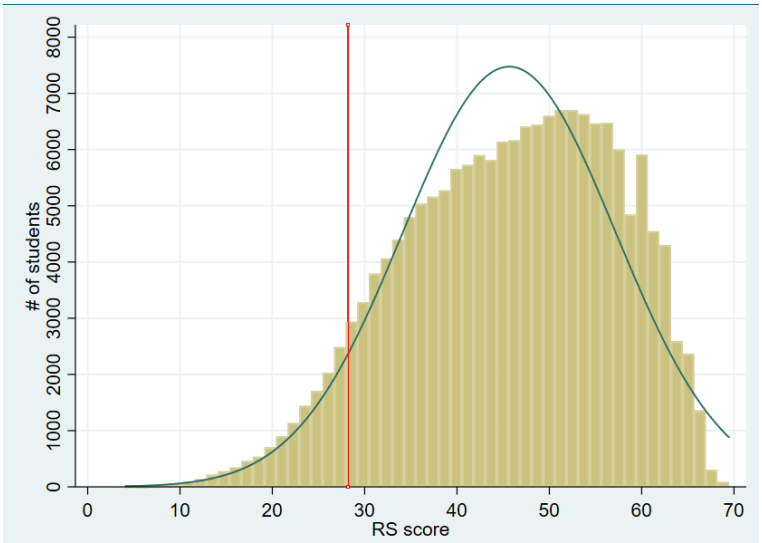
4.4 Effect estimation: RDD

Considering the program design, a simple OLS to compare beneficiaries and non-beneficiaries would yield biased estimates effect: not all the beneficiaries' characteristics are the same, a condition necessary to detect the effect of the BDH. Even if the sample is filtered for those around the threshold, OLS estimates do not consider the endogeneity that arises with program selection and the change on the probability of being treated. The RDD approach approximates a randomized experiment for those around the threshold which is a more sensitive method to stablish a causal impact of the program.

This section outlines the assumptions necessary to use a regression discontinuity approach. The principal assumption is the "no manipulation" of the treatment assignment rule which means that the households that receive the transfer must not be able to select themselves into the program. If this condition is not met, then it implies that there is not a random selection component around the threshold and the regression discontinuity design would be the wrong approach. However, it is not possible that households that receive the transfer are able to perfectly manipulate their score.

First, beneficiaries do not have knowledge about which variables are used to build the RS score and neither the weights that each variable has. Second, even though they may know the cutoff score (which is highly unlikely), they do not know their own score. In a practical sense, it is not possible that beneficiaries can modify their RS score so that they can receive the transfer. Additionally, it can be noticed that the RS score density plot in Figure 4.1does not show any visible discontinuity around the cutoff score (red line); the RS density is very similar to the normal density plot. For instance, if beneficiaries could be able to select themselves into the program then there would be grouping around the red line.

Figure 4.1
RS score density plot

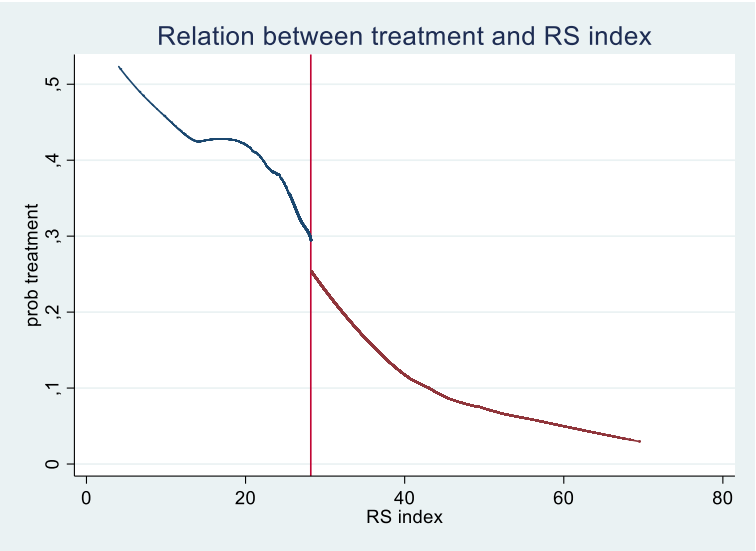


Source: Ser Bachiller data base 2017.

Elaboration: the author

In addition, the use of the regression discontinuity approach requires that the probability of receiving the BDH conditional on the RS score changes discontinuously at the threshold (28.2). Figure 4.2 displays two aspects. First, there is a discontinuity on the probability of treatment (to receive the BDH) at the cutoff score and that second, the treatment assignment rule is not perfect, which generates a non-linear relation between the RS score of each student and the actual treatment status (whether they receive or not the transfer).

Figure 4.2
Relation between treatment and RS index



Source: Ser Bachiller data base 2017.

Elaboration: the author

Previous studies have demonstrated that the BDH has targeting problems. There are eligible households that do not receive the transfer (exclusion mis-targeting) and not eligible households that are receiving the transfer (inclusion mis-targeting). For instance, Rinehart and McGuire (2017) evaluate the BDH using the Living Conditions Survey (ECV) to measure these targeting problems. Out of the 11.410 BDH beneficiaries (household level) in the survey, 35% of them are part of the inclusion mis-targeting while the exclusion mis-targeting affected 35% of the eligible population. Table 4.2 shows the statistics for this analysis. Out of 92.367 beneficiaries, the 74% of them are part of the inclusion mis-targeting whereas from the non-beneficiaries the 6% should receive the BDH.

Table 4.2
Treatment status according to RS index

	More than 28.2	Less than 28.2	Total
Non-beneficiaries	76087	4945	81032
	94%	**6%**	100%
Beneficiaries	8351	2984	11.335
	74%	**26%**	100%
Total	84438	7929	92367

Source: AFS 2017.

Elaboration: the author

Continuing with the empirical approach, the regression discontinuity is a good method to study the groups that are surrounding the cut off line in 28.2. Students that are close to the cut off score are supposed to be comparable considering that they have the same characteristics and their only difference is that one group receives the treatment and the other does not. This can be evidenced on Table 4.3 where I use a difference in means test to check if the selected observable characteristics are statistically different between beneficiaries and non-beneficiaries adding three types of subsamples that are ±1, ±2 and ±3 points around the cut off score. Only two of them present significant differences (area and number of household members) whereas the others are not statistically different from each other (the subsamples are balanced).

Table 4.3
Descriptive statistics for selected variables around cutoff (28.2)

	Difference Cutoff ±1	Difference Cutoff ±2	Difference Cutoff ±3
Female student	-0,042*	-0,014	-0,014
	'(0,02)	'(0,02)	'(0,01)
Area	0,167***	0,138***	0,126***
	'(0,02)	'(0,01)	'(0,01)
Number of household members	-0,111***	-0,100***	-0,100***
	'(0,03)	'(0,02)	'(0,02)
Illiterate mother	0,013	0,006	0,003
	'(0,01)	'(0,01)	'(0,01)
ISEC[17]	-0,01	0,009	0,016
	'(0,02)	'(0,01)	'(0,01)
N	2793	5435	8276

Source: AFS 2017.

Elaboration: the author

This means that the assignation rule to the treatment (BDH) works as a randomized experiment near the cut off score.

The observed discontinuity in the probability of treatment reflects the effect of the assignation rule, the RS index[18]. To test the causal effect of the BDH program I estimated the treatment effect with an instrumental variable (IV) setup:

IV-First stage:

$$D_i = \alpha_0 + \alpha T_i + \alpha_{RS} f(RS_i) + \alpha_x X_i + w_i \quad (3)$$

IV-Second stage:

$$Y_i = \beta_0 + \beta D_i + \beta_{RS} f(RS_i) + \beta_x X_i + u_i \quad (4)$$

Reduced form:

$$Y_i = \theta_0 + \theta T_i + \theta_{RS} f(RS_i) + \theta_x X_i + v_i \quad (5)$$

For equations 3 to 5, Y_i is the outcome variable, X_i is a vector of individual, household and educational characteristics and w_i, u_i and v_i random error terms. By estimating (4), the endogenous treatment status D_i is instrumented by the cutoff T_i, conditional on the polynomial of RS. Equation (5) is the regression of the outcome variable Y_i on the instrument T_i. The fuzzy IV-RDD estimator is β is obtained as the ratio of the reduced form coefficient of the instrument on the instrument estimated on the first stage (Angrist and Pischke 2014:229).

The non-linearity of the assignation rule observed in Figure 4.2 requires a fuzzy[19] RDD where the probability functions f(RS) can be approximated by pth-order polynomials (Angrist and Pischke 2008).

The RDD strategy has some pitfalls that are worth to be mentioned. First, RDD assumes that the functional relation between the outcome variable and treatment variable is known. If this relation is mis-specified, then the resulting estimates may be biased Ponce and Bedi (2010). Second, the resulting estimations are valid for the individuals that are around the cutoff line. It is not possible to generalize the results for all the individuals in the distribution.

Instead, an alternative approach that can be used is a difference in difference strategy but for that it is necessary to have data for one or more periods. However, the available information and the existence of the assignation rule permit to assume that the individuals around the cut off line are randomized which is what is desired by an impact evaluation methodology.

Chapter 5 Results

5.1 Descriptive statistics

Table 5.1 shows descriptive statistics for some descriptive variables and each of the outcomes defined in the previous section for students that belong to a beneficiary household (from now BDH students) and non-BDH students. The results indicate that BDH students come from rural areas, attended public high schools and take more time going to school compared with non-BDH students. They live in households with more family members and their mothers have basic education (a maximum of ten years of education).

The descriptive statistics provide evidence that, on average, there are significant differences in cognitive outcomes for BDH students. For the achievement measures on the Ser Bachiller exam, the non-BDH students have an average score of 7.54/10 whereas BDH students have an average score of 7.28, a difference of 25 decimal points. The greater difference is noticeable on the language class which is 32 decimal points. For the non-cognitive outcomes, the results show that BDH students have a higher motivation to investigate more and develop new ideas compared with non-BDH students, however, this is not the case with the other non-cognitive measures. Non-BDH students expect to achieve an advanced academic degree (master's degree) in a higher extent than BDH students and feel more academic self-esteem especially in mathematics and sciences classes. About the attendance variable, BDH students are less likely to be absent in school compared to non-beneficiaries.

Table 5.1
Descriptive statistics

	Non-BDH	BDH	Difference
Main characteristics			
Female	0,485	0,472	-0,013**
	(0,500)	(0,499)	-0,005
Area	0,877	0,753	-0,124***
	(0,329)	(0,431)	(0,003)
Private school	0,222	0,0844	-0,138***
	(0,416)	(0,278)	(0,004)
Public school	0,712	0,851	0,139***
	(0,453)	(0,356)	(0,004)
Time spent traveling to school (minutes)			
Between 15 and 30 minutes	0,404	0,391	-0,012*
	(0,491)	(0,488)	(0,005)
Between 31 minutes and 1 hour	0,158	0,184	0,026***
	(0,365)	(0,388)	(0,004)
More than one hour	0,0422	0,0702	0,028***
	(0,201)	(0,255)	(0,002)
Household characteristics			
Number of hosehold members	2,74	2,846	0,106***
	(0,797)	(0,888)	(0,008)
Mother's education level			
Basic general education	0,404	0,601	0,197***
	(0,491)	(0,490)	(0,005)
Baccalaureate, technical or technological education	0,352	0,213	-0,139***
	(0,478)	(0,409)	(0,005)
Third level or higher	0,175	0,0769	-0,099***
	(0,380)	(0,266)	(0,004)
Cognitive outcomes			
Global score (out of 10)	7,535	7,281	-0,254***
	(0,804)	(0,790)	(0,008)
Mathematics (out of 10)	7,287	7,052	-0,236***
	(0,911)	(0,884)	(0,009)
Language (out of 10)	8,091	7,769	-0,322***
	(0,942)	(0,974)	(0,009)

	Non-BDH	BDH	Difference
Natural sciences (out of 10)	7,281	7,046	-0,236***
	(1,008)	(1,016)	(0,01)
Social studies (out of 10)	7,476	7,254	-0,222***
	(0,966)	(0,978)	(0,01)
Non-cognitive outcomes			
About the knowledge acquired in your school:			
The acquired knowledge motivates me to investigate more, develop new ideas and put them into practice	0,399	0,471	0,072***
	(0,490)	(0,499)	(0,005)
What is the maximum level of studies you would like to achieve?			
Master's degree	0,336	0,300	-0,036***
	(0,472)	(0,458)	(0,005)
How do you consider yourself in mathematics, language, sciences and social studies classes?			
I consider I am an excellent student in mathematics class	0,065	0,044	-0,021***
	(0,246)	(0,205)	(0,003)
I consider I am an excellent student in language class	0,112	0,0923	-0,019***
	(0,315)	(0,290)	(0,004)
I consider I am an excellent student in sciences class	0,102	0,0822	-0,02***
	(0,302)	(0,275)	(0,004)
I consider I am an excellent student in social studies class	0,132	0,105	-0,026***
	(0,338)	(0,307)	(0,005)
School attendance			
During the last month in high school, I was never absent for a complete day	0,482	0,512	0,0300***
	(0,500)	(0,500)	(0,005)
Number of observations	81032	11335	

Note: t statistics in parentheses; * p<0.05, ** p<0.01, *** p<0.001

Source: AFS 2017.
Elaboration: the author

5.2 Main results

First, I computed a simple OLS regression to observe the effect of receiving BDH on the selected outcomes. The estimates for attendance are in Table 5.2, for the cognitive outcomes on Table 5.3 and for the non-cognitive outcomes on Table 5.4. Two different specifications were used: specification 1 (column 1) includes the variables female student, household's geographic location (urban or rural) and the RS polynomial. Specification 2 (column 2) ads variables about the type of school (public or private) and the time spent traveling to school in minutes (between 15 and 30 minutes, between 31 minutes and 1 hour or more than one hour), the number of household members and the mother's education (basic general education, baccalaureate-technical or higher level). For ease of visualization, only the main coefficients are displayed but complete tables can be found on the Appendix section. OLS estimates for school attendance in Table 5.2 show that the BDH has a positive but not significant relation

Table 5.2
OLS estimations of the BDH effect on school attendance (summary)

	Attendance (1)	Attendance (2)
BDH	0,006	0,002
	(0,01)	(0,01)
N	92021	91865
R^2	0,005	0,007

Note: t statistics in parentheses; * p<0.05, ** p<0.01, *** p<0.001; complete regression tables are in Appendix 2.

Source: AFS 2017.
Elaboration: the author

Results in Table 5.3 show that, on average, beneficiaries have lower scores than non-beneficiaries (Panel A). The advantage decreases for specification 2 which implies that the

overall set of variables used explain the difference. A similar effect is shown when looking at the effect by subject in Panel B. Here, the largest average effect is shown for sciences and social studies score. All the results are statistically significant.

Table 5.3
OLS estimations of the BDH effect on cognitive outcomes (summary)

Panel A

	Global Score (1)	**Global Score** (2)
BDH	-0,102***	-0,079***
	(0,01)	(0,01)
N	92367	92028
R^2	0,089	0,12

Panel B

	Mathematics (1)	**Mathematics** (2)	**Language** (1)	**Language** (2)	**Sciences** (1)	**Sciences** (2)	**Social Studies** (1)	**Social Studies** (2)
BDH	-0,083***	-0,064***	-0,140***	-0,115***	-0,092***	-0,068***	-0,092***	-0,068***
	(0,01)	(0,01)	(0,01)	(0,01)	(0,01)	(0,01)	(0,01)	(0,01)
N	92367	92028	92367	92028	92367	92028	92367	92028
R^2	0,071	0,093	0,087	0,112	0,056	0,076	0,047	0,067

Note: t statistics in parentheses; * p<0.05, ** p<0.01, *** p<0.001; complete regression tables are in Appendix 3.

Source: AFS 2017.
Elaboration: the author

For the non-cognitive outcomes (Table 5.4) it can be noticed that the motivation outcome has a significant and positive relation with beneficiaries whereas all the other non-cognitive outcomes (self-esteem on each class and higher education expectation) present a negative and significant relation (except for language and sciences self-esteem).

Table 5.4
OLS estimations of the BDH effect on non-cognitive outcomes (summary)

Panel A

	Motivation (1)	**Motivation** (2)	**Expected Level** (1)	**Expected Level** (2)
BDH	0,028***	0,026***	-0,036***	-0,027***
	(0,01)	(0,01)	(0,00)	(0,00)
N	91592	91427	92148	91999
R^2	0,016	0,018	0,067	0,085

Panel B

	Esteem-Math (1)	**Esteem-Math** (2)	**Esteem-Lang** (1)	**Esteem-Lang** (2)	**Esteem-Sci** (1)	**Esteem-Sci** (2)	**Esteem-Soc** (1)	**Esteem-Soc** (2)
BDH	-0,012***	-0,011***	-0,008	-0,006	-0,005	-0,002	-0,012**	-0,009*
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
N	46162	46071	46153	46062	46162	46069	46166	46074
R^2	0,007	0,01	0,009	0,012	0,008	0,012	0,009	0,012

Note: t statistics in parentheses; * p<0.05, ** p<0.01, *** p<0.001; complete regression tables are in Appendix 4.

Source: AFS 2017.
Elaboration: the author

The OLS estimates do not consider the BDH allocation rule which is a crucial factor when evaluating the program's effect. This could lead to biased estimates considering the fact that that the outcomes may be explained by factors that are in the error term. To control this endogeneity, the RS index will be examined with a discontinuity approach.

5.3 Regression discontinuity estimates

As discussed in Chapter 4, program participation is not random, and it is based on the RS index. This index was used to build a binary instrumental variable where 1 is assigned to the students which living conditions are below the allocation threshold and 0 if their score is above the threshold.

The first stage includes this instrument variable and provides the treatment effect (program participation) in the presence of the fuzzy discontinuity observed in Figure 4.2. Table 5.5 shows the estimates for equation (3). The difference in the number of observations for each specification is explained because of the non-response for some variables included in the specifications.

Table 5.5
RDD first stage (summary)

Variable	Specification 1	Specification 2
Below cutoff point of 28.2 (Z)	0.086***	0.075***
	(0.01)	(0.01)
N	92367	92028
R^2	0.084	0.093
F-Statistic on excluded instrument	86.85***	65.12***

Note: t statistics in parentheses; * p<0.05, ** p<0.01, *** p<0.001; complete regression tables are in Appendix 5.

Source: AFS 2017.

Elaboration: the author

There is a significant effect of the instrumental variable on program participation. Students from households that have a score equal or lower than 28.2 have an increased probability of participating in the program that ranges from 7.5 to 8.6 percentage points. The F-statistic from the excluded instrument is statistically significant indicating that there is a relationship between participation in the BDH and the assignment rule.

The instrumental variable estimates of the effect of the BDH on attendance, cognitive outcomes and non-cognitive outcomes are in Tables 5.6, 5.7 and 5.8 respectively. Considering that there are mis-targeting inclusion problems (non-eligible households that receive the transfer) and mis-targeting exclusion problems (eligible households that do not receive the transfer), the effect is computed in the second stage as a ratio with the first stage-equation (4). In the case of the attendance outcome, the BDH program has a significant and positive effect on students' attendance of about 0.40 percentage points.

Table 5.6
RDD second stage: IV estimates for attendance (summary)

	Attendance	Attendance
	(1)	(2)
BDH student	0.405***	0.400***
	(0.14)	(0.14)
N	92021	91865
R-sqr		

Note: t statistics in parentheses; + p<0.10, * p<0.05; complete regression tables are in Appendix 6.

Source: AFS 2017.

Elaboration: the author

Then, the effect of the BDH program over the global score ranges from -0.34 to -0.35, significant effect at the 10% level of confidence. For the specific scores, the BDH has a negative and significant effect at the 10% level on the mathematics score that ranges from -

0.37 to -0.44 points. The effect of the BDH on sciences score is also negative significant at the 5% level of -0.49 points for specification 1 and -0.54 points for specification 2 (significant at the 10% level). The program's effect for language, sciences and social studies scores is negative and non-significant.

Table 5.7
RDD second stage: IV estimates for cognitive outcomes (summary)

Panel A

	Global Score (1)	**Global Score** (2)
BDH student	-0.343+	-0.352+
	(0.18)	(0.21)
N	92367	92028
R^2	0.081	0.109

Panel B

	Mathe-matics (1)	**Mathe-matics** (2)	**Lan-guage** (1)	**Lan-guage** (2)	**Sciences** (1)	**Sciences** (2)	**Social Studies** (1)	**Social Studies** (2)
BDH student	-0.373+	-0.440+	-0.309	-0.243	-0.488*	-0.536+	-0.199	-0.186
	(0.20)	(0.24)	(0.23)	(0.26)	(0.24)	(0.28)	(0.23)	(0.27)
N	92367	92028	92367	92028	92367	92028	92367	92028
R^2	0.061	0.076	0.084	0.111	0.040	0.055	0.046	0.066

Note: t statistics in parentheses; + p<0.10, * p<0.05; complete regression tables are in Appendix 7.

Source: AFS 2017.

Elaboration: the author

In the case of non-cognitive outcomes, Table 5.8 shows that the effect of the BDH is small and positive for the motivation specifications, but they are not significant. Similarly, the BDH has a non-significant effect on the expected level of studies (master program). The program has a negative and significant effect at the 5% level for the academic self-esteem on mathematics class that ranges from -0.23 to -0.26 percentage points. For the academic self-esteem on language class the effect is higher: negative and significant at the 5% level of confidence and ranges from -0.29 to -0.33 percentage points. The effects for the academic self-esteem on sciences class and social studies class are not significant. Reduced forms of the outcome variables -estimations for equation (5) are in Appendix (9).

Table 5.8
RDD second stage: IV estimates for non-cognitive outcomes (summary)

Panel A

	Motivation (1)	**Motivation** (2)	**Expected Level** (1)	**Expected Level** (2)
BDH student	0.064	0.056	-0.187	-0.193
	(0.14)	(0.14)	(0.12)	(0.12)
N	91592	91427	92148	91999
R-sqr	0.016	0.017	.	.

Panel B

	Esteem-Math (1)	**Esteem-Math** (2)	**Esteem-Lang** (1)	**Esteem-Lang** (2)	**Esteem-Sci** (1)	**Esteem-Sci** (2)	**Esteem-Soc** (1)	**Esteem-Soc** (2)
BDH	-0.228*	-0.258*	-0.294*	-0.327*	0.051	0.047	-0.127	-0.141
student	(0.10)	(0.10)	(0.13)	(0.14)	(0.11)	(0.12)	(0.13)	(0.14)
N	46162	46071	46153	46062	46162	46069	46166	46074
R-sqr		.	.	.	0.004	0.010	.	

Note: t statistics in parentheses; + p<0.10, * p<0.05; complete regression tables are in Appendix 8.

Source: AFS 2017.

Elaboration: the author

5.4 Discussion

The BDH cash transfer has varied results among attendance, cognitive and non-cognitive outcomes. First, the BDH has a positive impact on beneficiaries' attendance which gives continuity to the group of findings of the positive impact of the program on children's school attendance (Schady and Araujo 2006; Rosero and Martínez 2012). This effect also fits into the first type of findings that Gneezy et al. (2011) distinguished for conditional cash transfers. The BDH has a negative impact on the general score: it may be that the BDH retains low-performance students that would have dropped school if they would not be receiving the transfer as it was evidenced by Araujo et al. (2017).

The mathematics and sciences scores are influenced negatively by program. Previous results for the Ser Bachiller exam evidence that the mathematics module is the hardest as it has the greatest percentage of students with insufficient results (whereas the best results are for the language module) (National Institute of Educative Evaluation 2016:103). The cognitive results for mathematics are linked with the negative impact found for the academic self-esteem. BDH students do not consider themselves excellent on the mathematics class and it may be the reason why they have an insufficient score on that exam module. This means that the program disincentives students' performance on mathematics class. The program has a negative impact on academic self-esteem for language class. Considering that language class requires more social interaction compared to mathematics class, it may be that BDH students feel less confident about interacting with their peers or integrating in group activities and therefore do not consider themselves as good students on this class.

Another result is that BDH beneficiaries are not expecting to achieve a higher education level than the one they are applying for (undergraduate education). This is coherent with the fact that students that perform bad on school tend to have bad expectations for their future and feel less motivated to achieve higher education levels (Little 2017:32). The results may be also related with Kearney and Levine's claim about how the lack of resources lead young household members to perceive lower returns of educational investments made on them which in turn affects their decision to aspire for a higher educational level (Kearney and Levine 2016:335). Though the overall household income is affected by the transfer, it is not translated into better academic achievements which contradicts Dahl and Lochner (2005) who found that increases in family income improves school achievements.

An alternative explanation related with the results is that because of the increased attendance, classrooms may be congested which affects negatively to students' learning. As it is argued by Bandura (1994), a more personalized classrooms enable students to receive individualized instruction and helps them to improve their perceived capabilities, expand their competencies and provides less basis for demoralizing social comparison (Bandura 1994:12). Congested classrooms are usual in Ecuador. The Ecuadorian legislation allows to have at most 40 students per room in public schools (Ministry of Education 2017) but in reality, educational institutions tend to have more than the limit. Moreover, it is a fact that the poorest groups assist to public schools; in the case of the data used on this study, 85% the BDH students attend to a public school. Though this finding is not related with better school performance, the fact that adolescents are attending school reduces the probability of engaging in risky situations (alcoholism, drug addiction, teenage pregnancy, etc.).

As it is argued by Wolf et al. (2013), cash transfers can also have unintended consequences as they can encourage beneficiaries to stop investing in further education or stop working because of the incoming amount of money that the receive periodically. It means that cash transfers generate dependency feelings towards the government's social assistance which is not motivating beneficiaries to improve their living conditions.

The findings of this study show that beneficiaries are only attending school, which was claimed by Wolf et al. (2013) as the main effect of cash transfers on adolescents, but it is not translated into better achievements, more motivation or expectations which are the most important elements to improve their conditions and a more conscious solution to reduce inequality gaps and break the cycle of poverty.

Chapter 6 Conclusions

The BDH cash transfer program has negative effects on cognitive and non-cognitive measures. Though the impact on school attendance is positive, it is not translated into better academic achievements or increased motivation, self-esteem or expectations.

The results indicate that students that are near the assignation score (28.2) have an increased probability of participating in the program of 7.5 to 8.6 percentage points. The BDH has a positive and significant impact on school attendance of around 0.40 percentage points. For the cognitive measures, the program revealed a statistically significant negative effect on the general score that ranges from -0.34 to -0.35 points and a negative and significant effect for the mathematics and sciences score. For the non-cognitive outcomes, the BDH has a negative impact on students' academic self-esteem in mathematics (ranging from 0.23 to 0.26 percentage points) and in language class (ranging from 0.29 to 0.33 percentage points).

The present study does not examine long-term effects of the BDH cash transfer. In this sense, any result is an inference for the year 2017. A long-term analysis is necessary to check if the continuous receipt of the monetary compensation has effects of children compared with a temporary change. On the educational sphere, even if the transfer is promoting school attendance it does not imply that children are doing better in school and feel motivated enough to pursue an improved well-being condition. As it was explained, Handa and Davis (2006) point out that the increases on school attendance is only a proof of effective implementation of the programs as they are conditioned on parents sending their children to school, but this does not mean that children are better educated. Additionally, it is important to highlight the conclusion that many of the authors have claimed about these programs: demand side interventions are not sufficient to boost educational outcomes; these programs must go with the hand of improvements in education quality (e.g. better curriculums) and well-trained school teachers (Ponce and Bedi 2010; Handa and Davis 2006).

These effects must be considered to improve the program and add new elements that can help to accomplish them. For instance, there are cash transfer programs that are mixed with familiar psychological stimulation (interventions that support parents) and have significant benefits on tests for cognitive outcomes like reading and mathematics and non-cognitive outcomes in the long term (Walker et al. 2011; Fernald et al. 2017).

Appendices

Appendix 1
RS replication: methodological aspects

List of variables used for the index

The available data allowed to recreate the following variables:

1. Housing floor material
2. Exclusive shower
3. Type of household hygiene service
4. Material of the walls of the house
5. Source of water supply
6. Overcrowding
7. Zoning (amanzanado / disperso)
8. Number of people per household
9. Level of instruction of the head of household
10. Number of computers
11. Number of washing machines
12. Number of microwave ovens
13. Number of refrigerators
14. Number of conventional telephone lines
15. Number of cars
16. Internet availability in the home
17. Illiteracy
18. Head of household with social security
19. Number of televisions and dvd
20. Number of cell phones (per / person 10 years and over)
21. Housing tenure

Some variables required a process to be comparable with the original ones. The following are specifications of this:

- Number of persons in each household: to measure this variable the relevant questions included were:

  With whom you live? Select all that apply. Mother (Yes/No)

  With whom you live? Select all that apply. Father (Yes/No)

  With whom you live? Select all that apply. Brothers (Yes/No)

  With whom you live? Select all that apply. Grandparents (Yes/No)

  With whom you live? Select all that apply. Uncles (Yes/No)

  With whom you live? Select all that apply. Children) (Yes/No)

  With whom you live? Select all that apply. Spouse, partner or partner (Yes/No)

  With whom you live? Select all that apply. Alone (Yes/No)

  There are students that declare to live alone but also answered that live with their parents, for these cases it was considered that the student is not living alone. The excluded questions are:

With whom you live? Select all that apply. Others (Yes/No)

With whom you live? Select all that apply. I am in a situation of deprivation of liberty (Yes/No)

The first question may lead to ambiguous results; it could be that the student is living with friends and for this study it is important that the student lives with their family or a family member given their role in their education. The second question can also lead to ambiguities considering that it is unknown how long the student is in that situation. To construct the variable ***numper***, a 1 was assigned if the student answered YES to any of the selected questions and 0 if the answer is NO.

- Overcrowding: considering the available data, the overcrowding variable is equal to 1 if the student declares that he/she does not have a dorm for himself/herself (he/she shares its dorm).
- Housing tenure: for this variable there was no variable that indicates the type of tenure of the house. However, it was assumed that people are the owners of the following the types of housing: suite room, apartment in house or building or house.
- Literacy: it was assumed that mothers/fathers without education (declared by the student) are illiterate.

Appendix 2

OLS complete estimations of the BDH effect on attendance

	Attendance (1)	**Attendance** (2)
BDH student	0,006	0,002
	(0,01)	(0,01)
RS	-0,015***	-0,017***
	(0,00)	(0,00)
RS^2	0,000**	0,000***
	(0,00)	(0,00)
RS^3	-0,000**	-0,000***
	(0,00)	(0,00)
Sex	-0,035***	-0,035***
	(0,00)	(0,00)
Area	-0,026***	-0,021***
	(0,00)	(0,00)
Private high school		-0,065***
		(0,01)
Public high school		-0,054***
		(0,01)
Between 15 and 30 minutes		-0,016***
		(0,00)
Between 31 minutes and 1 hour		-0,023***
		(0,00)
More than one hour		-0,016*
		(0,01)
Number of household members		0,014***
		(0,00)
Mother: basic education		0,046***
		(0,01)
Mother: baccalaureate or technical		0,030***
		(0,01)
Mother: higher education		0,040***
		(0,01)
Constant	0,788***	0,816***
	(0,05)	(0,05)
N	92021	91865
R-sqr	0,005	0,007

Note: t statistics in parentheses; * p<0.05, ** p<0.01, *** p<0.001

Source: AFS 2017.

Elaboration: the author

Appendix 3

OLS complete estimations of the BDH effect on cognitive outcomes

	Global Score	**Global Score**	**Mathematics**	**Mathematics**	**Language**	**Language**
	(1)	(2)	(1)	(2)	(1)	(2)
BDH student	-0,102***	-0,079***	-0,083***	-0,064***	-0,140***	-0,115***
	(0,01)	(0,01)	(0,01)	(0,01)	(0,01)	(0,01)
RS	0	0,007	0,01	0,015*	-0,009	0,002
	(0,01)	(0,01)	(0,01)	(0,01)	(0,01)	(0,01)
RS^2	0	0	0	-0,000*	0	0
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
RS^3	0,000**	0,000*	0,000***	0,000***	0	0
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
Sex	0,056***	0,050***	0,004	-0,001	0,138***	0,132***
	(0,01)	(0,01)	(0,01)	(0,01)	(0,01)	(0,01)
Area	0,060***	0,037***	0,082***	0,061***	0,102***	0,075***
	(0,01)	(0,01)	(0,01)	(0,01)	(0,01)	(0,01)
Private high school		0,043***		0,003		0,058***
		(0,01)		(0,01)		(0,01)
Public high school		-0,194***		-0,232***		-0,147***
		(0,01)		(0,01)		(0,01)
Between 15 and 30 minutes		0,024***		0,016*		0,035***
		(0,01)		(0,01)		(0,01)
Between 31 minutes and 1 hour		0,039***		0,040***		0,058***
		(0,01)		(0,01)		(0,01)
More than one hour		-0,013		-0,002		-0,023
		(0,01)		(0,01)		(0,02)
Number of household members		0,008*		0,012***		0,011**
		(0,00)		(0,00)		(0,00)
Mother: basic education		0,062***		0,048***		0,087***
		(0,01)		(0,01)		(0,01)
Mother: baccalaureate/technical		0,217***		0,182***		0,284***
		(0,01)		(0,01)		(0,01)
Mother: higher education		0,339***		0,297***		0,412***
		(0,01)		(0,01)		(0,01)
Constant	7,096***	7,082***	6,769***	6,803***	7,568***	7,437***
	(0,08)	(0,08)	(0,08)	(0,09)	(0,09)	(0,10)
N	92367	92028	92367	92028	92367	92028
R^2	0,089	0,12	0,071	0,093	0,087	0,112

Note: t statistics in parentheses; * p<0.05, ** p<0.01, *** p<0.001

Source: AFS 2017.

Elaboration: the author

OLS estimations of the BDH effect on cognitive outcomes (continued)

	Sciences (1)	**Sciences** (2)	**Social Studies** (1)	**Social Studies** (2)
BDH student	-0,092***	-0,068***	-0,092***	-0,068***
	(0,01)	(0,01)	(0,01)	(0,01)
RS	0	0,007	0,001	0,005
	(0,01)	(0,01)	(0,01)	(0,01)
RS^2	0	0	0	0
	(0,00)	(0,00)	(0,00)	(0,00)
RS^3	0,000**	0,000*	0,000*	0
	(0,00)	(0,00)	(0,00)	(0,00)
Sex	0,022***	0,015*	0,060***	0,054***
	(0,01)	(0,01)	(0,01)	(0,01)
Area	0,033***	0,008	0,024*	0,002
	(0,01)	(0,01)	(0,01)	(0,01)
Private high school		0,032*		0,080***
		(0,01)		(0,01)
Public high school		-0,208***		-0,187***
		(0,01)		(0,01)
Between 15 and 30 minutes		0,025***		0,019**
		(0,01)		(0,01)
Between 31 minutes and 1 hour		0,038***		0,021*
		(0,01)		(0,01)
More than one hour		-0,01		-0,018
		(0,02)		(0,02)
Number of household members		0		0,008*
		(0,00)		(0,00)
Mother: basic education		0,054***		0,059***
		(0,01)		(0,01)
Mother: baccalaureate or technical		0,212***		0,191***
		(0,01)		(0,01)
Mother: higher education		0,347***		0,300***
		(0,02)		(0,02)
Constant	6,940***	6,958***	7,102***	7,124***
	(0,10)	(0,10)	(0,10)	(0,10)
N	92367	92028	92367	92028
R-sqr	0,056	0,076	0,047	0,067

Note: t statistics in parentheses; * p<0.05, ** p<0.01, *** p<0.001

Source: AFS 2017.

Elaboration: the author

Appendix 4

OLS complete estimations of the BDH effect on non-cognitive outcomes

	Motivation (1)	**Motivation** (2)	**Expected Lvl.** (1)	**Expected Lvl.** (2)
BDH student	0,028***	0,026***	-0,036***	-0,027***
	(0,01)	(0,01)	(0,00)	(0,00)
RS	0	-0,004	0,004	0,005
	(0,00)	(0,00)	(0,00)	(0,00)
RS^2	0	0	0	0
	(0,00)	(0,00)	(0,00)	(0,00)
RS^3	0	0	0,000***	0,000*
	(0,00)	(0,00)	(0,00)	(0,00)
Sex	0,043***	0,043***	0,138***	0,136***
	(0,00)	(0,00)	(0,00)	(0,00)
Area	-0,045***	-0,039***	0,032***	0,021***
	(0,00)	(0,00)	(0,00)	(0,00)
Private high school		-0,020**		0,020**
		(0,01)		(0,01)
Public high school		-0,019**		-0,063***
		(0,01)		(0,01)
Between 15 and 30 minutes		-0,026***		0,008*
		(0,00)		(0,00)
Between 31 minutes and 1 hour		-0,036***		0,033***
		(0,00)		(0,00)
More than one hour		-0,015		0,026***
		(0,01)		(0,01)
Number of household members		0,002		-0,003
		(0,00)		(0,00)
Mother: basic education		0,027***		0,014**
		(0,01)		(0,01)
Mother: baccalaureate or technical		-0,005		0,086***
		(0,01)		(0,01)
Mother: higher education		-0,006		0,163***
		(0,01)		(0,01)
Constant	0,573***	0,622***	0,036	0,056
	(0,05)	(0,05)	(0,04)	(0,04)
N	91592	91427	92148	91999
R-sqr	0,016	0,018	0,067	0,085

Note: t statistics in parentheses; * p<0.05, ** p<0.01, *** p<0.001

Source: AFS 2017.

Elaboration: the author

OLS estimations of the BDH effect on non-cognitive outcomes (continued)

	Esteem-Math (1)	**Esteem-Math** (2)	**Esteem-Lang** (1)	**Esteem-Lang** (2)	**Esteem-Sci** (1)	**Esteem-Sci** (2)
BDH student	-0,012***	-0,011***	-0,008	-0,006	-0,005	-0,002
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
RS	0	0	-0,001	-0,001	-0,003	-0,003
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
RS^2	0	0	0	0	0	0
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
RS^3	0	0	0	0	0	0
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
Sex	-0,022***	-0,023***	0,050***	0,050***	0,018***	0,017***
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
Area	0,001	-0,001	0,004	0,002	0,015***	0,012**
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
Private high school		0,008		0,006		0,019**
		(0,01)		(0,01)		(0,01)
Public high school		-0,013**		0,009		0,005
		(0,00)		(0,01)		(0,01)
Between 15 and 30 minutes		-0,001		-0,009**		-0,006
		(0,00)		(0,00)		(0,00)
Between 31 minutes and 1 hour		0,004		-0,005		0
		(0,00)		(0,00)		(0,00)
More than one hour		0,002		0,012		0,01
		(0,01)		(0,01)		(0,01)
Number of household members		0,004**		0		0
		(0,00)		(0,00)		(0,00)
Mother: basic education		0,007		0,007		0,006
		(0,00)		(0,01)		(0,00)
Mother: baccalaureate or technical		0,022***		0,034***		0,033***
		(0,00)		(0,01)		(0,01)
Mother: higher education		0,030***		0,055***		0,065***
		(0,01)		(0,01)		(0,01)
Constant	0,056	0,054	0,071	0,06	0,103*	0,091*
	(0,04)	(0,04)	(0,04)	(0,04)	(0,04)	(0,04)
N	46162	46071	46153	46062	46162	46069
R-sqr	0,007	0,01	0,009	0,012	0,008	0,012

Note: t statistics in parentheses; * p<0.05, ** p<0.01, *** p<0.001

Source: AFS 2017.

Elaboration: the author

OLS estimations of the BDH effect on non-cognitive outcomes (continued)

	Esteem-Soc (1)	**Esteem-Soc** (2)
BDH student	-0,012**	-0,009*
	(0,00)	(0,00)
RS	-0,003	-0,004
	(0,00)	(0,00)
RS^2	0	0
	(0,00)	(0,00)
RS^3	0	0
	(0,00)	(0,00)
Sex	0,032***	0,031***
	(0,00)	(0,00)
Area	0,004	0,001
	(0,00)	(0,00)
Private high school		0,011
		(0,01)
Public high school		-0,001
		(0,01)
Between 15 and 30 minutes		-0,007*
		(0,00)
Between 31 minutes and 1 hour		0,001
		(0,00)
More than one hour		0,002
		(0,01)
Number of household members		-0,005**
		(0,00)
Mother: basic education		0,014*
		(0,01)
Mother: baccalaureate or technical		0,039***
		(0,01)
Mother: higher education		0,066***
		(0,01)
Constant	0,135**	0,155**
	(0,05)	(0,05)
N	46166	46074
R-sqr	0,009	0,012

Note: t statistics in parentheses; * p<0.05, ** p<0.01, *** p<0.001

Source: AFS 2017.

Elaboration: the author

Appendix 5

RDD first stage (complete)

	Specification 1	**Specifica-tion 2**
T_hat	0.086***	0.075***
	(0.01)	(0.01)
RS	-0.019***	-0.029***
	(0.00)	(0.00)
RS^2	0.000	0.000***
	(0.00)	(0.00)
RS^3	0.000	-0.000
	(0.00)	(0.00)
Sex	-0.007***	-0.006**
	(0.00)	(0.00)
Area	-0.060***	-0.055***
	(0.00)	(0.00)
Private high school		-0.034***
		(0.00)
Public high school		-0.003
		(0.00)
Between 15 and 30 minutes		0.003
		(0.00)
Between 31 minutes and 1 hour		0.015***
		(0.00)
More than one hour		0.034***
		(0.01)
Number of household members		0.021***
		(0.00)
Mother: basic education		0.015**
		(0.00)
Mother: baccalaureate or technical		-0.017***
		(0.00)
Mother: higher education		-0.014**
		(0.01)
Constant	0.703***	0.783***
	(0.06)	(0.06)
N	92367	92028
R^2	0.084	0.093
F-Statistic on excluded instrument	86.85***	65.12***

Note: t statistics in parentheses; * p<0.05, ** p<0.01, *** p<0.001

Source: AFS 2017.

Elaboration: the author

Appendix 6

RDD second stage: IV estimates for attendance (complete)

	Attendance (1)	**Attendance** (2)
BDH student	0.405***	0.400***
	(0.14)	(0.14)
RS	0.004	0.001
	(0.01)	(0.01)
RS^2	0.000	0.000
	(0.00)	(0.00)
RS^3	-0.000	-0.000
	(0.00)	(0.00)
Sex	-0.032***	-0.033***
	(0.00)	(0.00)
Area	-0.002	0.001
	(0.01)	(0.01)
Private high school		-0.051***
		(0.01)
Public high school		-0.053***
		(0.01)
Between 15 and 30 minutes		-0.018***
		(0.00)
Between 31 minutes and 1 hour		-0.030***
		(0.01)
More than one hour		-0.030***
		(0.01)
Number of household members		0.005
		(0.00)
Mother: basic education		0.039***
		(0.01)
Mother: baccalaureate or technical		0.037***
		(0.01)
Mother: higher education		0.046***
		(0.01)
Constant	0.323+	0.382*
	(0.17)	(0.16)
N	92021	91865
R-sqr		

Note: t statistics in parentheses; + p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Source: AFS 2017.

Elaboration: the author

Appendix 7

RDD second stage: IV estimates for cognitive outcomes (complete)

	Global Score	**Global Score**	**Mathematics**	**Mathematics**	**Language**	**Language**
	(1)	(2)	(1)	(2)	(1)	(2)
BDH student	-0.343+	-0.352+	-0.373+	-0.440+	-0.309	-0.243
	(0.18)	(0.21)	(0.20)	(0.24)	(0.23)	(0.26)
RS	-0.009	-0.006	-0.002	-0.002	-0.015	-0.004
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
RS^2	0.000	0.000	-0.000	-0.000	0.000*	0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
RS^3	0.000*	0.000	0.000***	0.000*	-0.000	-0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Sex	0.054***	0.048***	0.002	-0.003	0.137***	0.131***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Area	0.046***	0.022	0.065***	0.041***	0.092***	0.068***
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
Private high school		0.034*		-0.010		0.054***
		(0.01)		(0.02)		(0.02)
Public high school		-0.195***		-0.234***		-0.148***
		(0.01)		(0.01)		(0.01)
Between 15 and 30 minutes		0.025***		0.017***		0.036***
		(0.01)		(0.01)		(0.01)
Between 31 minutes and 1 hour		0.044***		0.046***		0.060***
		(0.01)		(0.01)		(0.01)
More than one hour		-0.004		0.011		-0.019
		(0.01)		(0.02)		(0.02)
Number of household members		0.013*		0.020***		0.013*
		(0.01)		(0.01)		(0.01)
Mother: basic education		0.066***		0.054***		0.089***
		(0.01)		(0.01)		(0.01)
Mother: baccalaureate or technical		0.213***		0.176***		0.282***
		(0.01)		(0.01)		(0.01)
Mother: higher education		0.335***		0.292***		0.410***
		(0.01)		(0.01)		(0.02)
Constant	7.348***	7.380***	7.071***	7.214***	7.745***	7.577***
	(0.21)	(0.25)	(0.23)	(0.27)	(0.26)	(0.31)
N	92367	92028	92367	92028	92367	92028
R^2	0.081	0.109	0.061	0.076	0.084	0.111

Note: t statistics in parentheses; + p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Source: AFS 2017.

Elaboration: the author

RDD second stage: IV estimates for cognitive outcomes (complete) (continued)

	Sciences	**Sciences**	**Social Studies**	**Social Studies**
	(1)	(2)	(1)	(2)
BDH student	-0.488*	-0.536+	-0.199	-0.186
	(0.24)	(0.28)	(0.23)	(0.27)
RS	-0.015	-0.015	-0.003	-0.001
	(0.01)	(0.02)	(0.01)	(0.01)
RS^2	0.000	0.000	0.000	0.000
	(0.00)	(0.00)	(0.00)	(0.00)
RS^3	0.000*	0.000	0.000+	0.000
	(0.00)	(0.00)	(0.00)	(0.00)
Sex	0.019***	0.013+	0.059***	0.053***
	(0.01)	(0.01)	(0.01)	(0.01)
Area	0.009	-0.017	0.017	-0.005
	(0.02)	(0.02)	(0.02)	(0.02)
Private high school		0.016		0.075***
		(0.02)		(0.02)
Public high school		-0.209***		-0.188***
		(0.01)		(0.01)
Between 15 and 30 minutes		0.027***		0.020***
		(0.01)		(0.01)
Between 31 minutes and 1 hour		0.045***		0.022*
		(0.01)		(0.01)
More than one hour		0.006		-0.014
		(0.02)		(0.02)
Number of household members		0.010		0.010
		(0.01)		(0.01)
Mother: basic education		0.061***		0.061***
		(0.01)		(0.01)
Mother: baccalaureate or technical		0.204***		0.189***
		(0.01)		(0.01)
Mother: higher education		0.341***		0.298***
		(0.02)		(0.02)
Constant	7.352***	7.468***	7.214***	7.253***
	(0.27)	(0.33)	(0.26)	(0.31)
N	92367	92028	92367	92028
R^2	0.040	0.055	0.046	0.066

Note: t statistics in parentheses; + p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Source: AFS 2017.

Elaboration: the author

Appendix 8

RDD second stage: IV estimates for non-cognitive outcomes (complete)

	Motivation (1)	**Motivation** (2)	**Expected Level** (1)	**Expected Level** (2)
BDH student	0.064	0.056	-0.187	-0.193
	(0.14)	(0.14)	(0.12)	(0.12)
RS	0.001	-0.002	-0.005	-0.007
	(0.01)	(0.01)	(0.01)	(0.01)
RS^2	-0.000	-0.000	0.000	0.000+
	(0.00)	(0.00)	(0.00)	(0.00)
RS^3	0.000	0.000	-0.000+	-0.000*
	(0.00)	(0.00)	(0.00)	(0.00)
Sex	0.043***	0.043***	0.014***	0.013***
	(0.00)	(0.00)	(0.00)	(0.00)
Area	-0.043***	-0.037***	0.014+	0.013
	(0.01)	(0.01)	(0.01)	(0.01)
Private high school		-0.019*		-0.002
		(0.01)		(0.01)
Public high school		-0.019***		-0.006
		(0.01)		(0.01)
Between 15 and 30 minutes		-0.026***		0.016***
		(0.00)		(0.00)
Between 31 minutes and 1 hour		-0.037***		0.014***
		(0.01)		(0.01)
More than one hour		-0.016+		-0.002
		(0.01)		(0.01)
Number of household members		0.002		0.004
		(0.00)		(0.00)
Mother: basic education		0.027***		0.037***
		(0.01)		(0.01)
Mother: baccalaureate or technical		-0.005		0.043***
		(0.01)		(0.01)
Mother: higher education		-0.006		0.035***
		(0.01)		(0.01)
Constant	0.532***	0.589***	0.364*	0.357*
	(0.17)	(0.16)	(0.14)	(0.14)
N	91592	91427	92148	91999
R-sqr	0.016	0.017	.	.

Note: t statistics in parentheses; + p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Source: AFS 2017.

Elaboration: the author

RDD second stage: IV estimates for non-cognitive outcomes (complete) (continued)

	Esteem-Math	**Esteem-Math**	**Esteem-Lang**	**Esteem-Lang**	**Esteem-Sci**	**Esteem-Sci**
	(1)	(2)	(1)	(2)	(1)	(2)
BDH student	-0.228*	-0.258*	-0.294*	-0.327*	0.051	0.047
	(0.10)	(0.10)	(0.13)	(0.14)	(0.11)	(0.12)
RS	-0.009+	-0.011+	-0.014*	-0.015*	-0.001	-0.001
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
RS^2	0.000	0.000	0.000+	0.000+	0.000	0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
RS^3	-0.000	-0.000	-0.000	-0.000	0.000	-0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Sex	-0.023***	-0.024***	0.048***	0.048***	0.018***	0.018***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Area	-0.011+	-0.014*	-0.012	-0.015+	0.018*	0.015*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Private high school		-0.003		-0.007		0.021***
		(0.01)		(0.01)		(0.01)
Public high school		-0.016***		0.006		0.005
		(0.01)		(0.01)		(0.01)
Between 15 and 30 minutes		-0.001		-0.009***		-0.006+
		(0.00)		(0.00)		(0.00)
Between 31 minutes and 1 hour		0.007+		-0.001		-0.001
		(0.00)		(0.00)		(0.00)
More than one hour		0.014+		0.027***		0.008
		(0.01)		(0.01)		(0.01)
Number of household members		0.008***		0.006+		-0.001
		(0.00)		(0.00)		(0.00)
Mother: basic education		0.011*		0.012*		0.005
		(0.00)		(0.01)		(0.01)
Mother: baccalaureate or technical		0.019***		0.030***		0.034***
		(0.00)		(0.01)		(0.01)
Mother: higher education		0.028***		0.053***		0.065***
		(0.01)		(0.01)		(0.01)
Constant	0.302*	0.320***	0.396***	0.406***	0.039	0.038
	(0.12)	(0.12)	(0.15)	(0.16)	(0.13)	(0.13)
N	46162	46071	46153	46062	46162	46069
R-sqr		.	.	.	0.004	0.010

Note: t statistics in parentheses; + p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Source: AFS 2017.

Elaboration: the author

RDD second stage: IV estimates for non-cognitive outcomes (complete) (continued)

	Esteem-Soc (1)	**Esteem-Soc** (2)
BDH student	-0.127	-0.141
	(0.13)	(0.14)
RS	-0.008	-0.010
	(0.01)	(0.01)
RS^2	0.000	0.000
	(0.00)	(0.00)
RS^3	0.000	-0.000
	(0.00)	(0.00)
Sex	0.031***	0.030***
	(0.00)	(0.00)
Area	-0.003	-0.006
	(0.01)	(0.01)
Private high school		0.005
		(0.01)
Public high school		-0.003
		(0.01)
Between 15 and 30 minutes		-0.007*
		(0.00)
Between 31 minutes and 1 hour		0.002
		(0.01)
More than one hour		0.008
		(0.01)
Number of household members		-0.003
		(0.00)
Mother: basic education		0.016***
		(0.01)
Mother: baccalaureate or technical		0.037***
		(0.01)
Mother: higher education		0.065***
		(0.01)
Constant	0.265+	0.297+
	(0.16)	(0.16)
N	46166	46074
R-sqr	.	

Note: t statistics in parentheses; + p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Source: AFS 2017.

Elaboration: the author

Appendix 9

RDD reduced form for attendance (complete)

	Attendance (1)	**Attendance** (2)
Below cutoff point of 28.2	0,021**	0,019*
	(0,01)	(0,01)
RS	-0,015***	-0,013***
	(0,00)	(0,00)
RS^2	0,000***	0,000***
	(0,00)	(0,00)
RS^3	-0,000***	-0,000***
	(0,00)	(0,00)
Sex	-0,024***	-0,024***
	(0,00)	(0,00)
Area	-0,019***	-0,016***
	(0,00)	(0,00)
Private high school		-0,081***
		(0,01)
Public high school		-0,043***
		(0,00)
Between 15 and 30 minutes		0,001
		(0,00)
Between 31 minutes and 1 hour		0,008*
		(0,00)
More than one hour		0,004
		(0,01)
Number of household members		0,017***
		(0,00)
Mother: basic education		0,035***
		(0,00)
Mother: baccalaureate, technical or technological education		0,013*
		(0,01)
Mother: higher education		0,009
		(0,01)
Constant	0,755***	0,703***
	(0,05)	(0,05)
N	171105	170941
R^2	0,004	0,007

Note: t statistics in parentheses; * p<0.05, ** p<0.01, *** p<0.001

Source: AFS 2017.

Elaboration: the author

Appendix 10

RDD reduced form for cognitive outcomes (complete)

	Global Score	**Global Score**	**Mathema-tics**	**Mathema-tics**	**Lan-guage**	**Lan-guage**
	(1)	(2)	(1)	(2)	(1)	(2)
Below cutoff point of 28.2	-0,007	-0,001	-0,007	-0,006	-0,008	0,01
	(0,01)	(0,01)	(0,01)	(0,01)	(0,01)	(0,01)
RS	0,026***	0,022***	0,021***	0,017**	0,039***	0,034***
	(0,00)	(0,00)	(0,01)	(0,01)	(0,01)	(0,01)
RS^2	-0,001***	-0,000**	-0,000***	-0,000*	-0,001***	-0,000***
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
RS^3	0,000***	0,000***	0,000***	0,000***	0,000***	0,000***
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
Sex	0,059***	0,054***	0,027***	0,023***	0,129***	0,123***
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
Area	0,081***	0,061***	0,097***	0,082***	0,167***	0,132***
	(0,00)	(0,00)	(0,01)	(0,01)	(0,01)	(0,01)
Private high school		0,033***		0		0,086***
		(0,01)		(0,01)		(0,01)
Public high school		-0,232***		-0,284***		-0,144***
		(0,01)		(0,01)		(0,01)
Between 15 and 30 minutes		0,058***		0,070***		0,026***
		(0,00)		(0,01)		(0,00)
Between 31 minutes and 1 hour		0,085***		0,105***		0,039***
		(0,01)		(0,01)		(0,01)
More than one hour		0,019*		0,039***		-0,032**
		(0,01)		(0,01)		(0,01)
Number of household members		-0,007**		0,004		-0,022***
		(0,00)		(0,00)		(0,00)
Mother: basic education		0,118***		0,129***		0,118***
		(0,01)		(0,01)		(0,01)
Mother: baccalaureate or technical education		0,182***		0,136***		0,345***
		(0,01)		(0,01)		(0,01)
Mother: higher education		0,158***		0,084***		0,343***
		(0,01)		(0,01)		(0,01)
Constant	6,665***	6,777***	6,565***	6,685***	6,699***	6,792***
	(0,07)	(0,07)	(0,08)	(0,08)	(0,09)	(0,09)
N	171457	171110	171457	171110	171457	171110
R^2	0,138	0,161	0,113	0,131	0,119	0,146

Note: t statistics in parentheses; * p<0.05, ** p<0.01, *** p<0.001

Source: AFS 2017.

Elaboration: the author

RDD reduced form for cognitive outcomes (complete) (continued)

	Sciences	**Sciences**	**Social Studies**	**Social Studies**
	(1)	(2)	(1)	(2)
Below cutoff point of 28.2	-0,01	-0,007	-0,004	0
	(0,02)	(0,02)	(0,02)	(0,02)
RS	0,018**	0,014*	0,028***	0,024***
	(0,01)	(0,01)	(0,01)	(0,01)
RS^2	-0,000**	0	-0,001***	-0,000*
	(0,00)	(0,00)	(0,00)	(0,00)
RS^3	0,000***	0,000***	0,000***	0,000***
	(0,00)	(0,00)	(0,00)	(0,00)
Sex	0,032***	0,028***	0,047***	0,042***
	(0,00)	(0,00)	(0,00)	(0,00)
Area	0,025***	0,008	0,037***	0,022***
	(0,01)	(0,01)	(0,01)	(0,01)
Private high school		0,003		0,045***
		(0,01)		(0,01)
Public high school		-0,266***		-0,233***
		(0,01)		(0,01)
Between 15 and 30 minutes		0,069***		0,068***
		(0,01)		(0,01)
Between 31 minutes and 1 hour		0,097***		0,098***
		(0,01)		(0,01)
More than one hour		0,029**		0,041***
		(0,01)		(0,01)
Number of household members		-0,006*		-0,004
		(0,00)		(0,00)
Mother: basic education		0,106***		0,118***
		(0,01)		(0,01)
Mother: baccalaureate or technical		0,125***		0,121***
		(0,01)		(0,01)
Mother: higher education		0,119***		0,086***
		(0,01)		(0,01)
Constant	6,698***	6,841***	6,691***	6,785***
	(0,09)	(0,09)	(0,09)	(0,09)
N	171457	171110	171457	171110
R^2	0,081	0,096	0,083	0,099

Note: t statistics in parentheses; * p<0.05, ** p<0.01, *** p<0.001

Source: AFS 2017.

Elaboration: the author

Appendix 11

RDD reduced form for non-cognitive outcomes (complete)

	Motivation	**Motivation**	**Expected Lvl.**	**Expected Lvl.**	**Esteem-Math**	**Esteem-Math**
	(1)	(2)	(1)	(2)	(1)	(2)
Below cutoff point of 28.2	0,005	0,004	-0,01	-0,01	-0,007	-0,008
	(0,01)	(0,01)	(0,01)	(0,01)	(0,01)	(0,01)
RS	0,001	0,003	0,008**	0,007*	-0,004	-0,004
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
RS^2	-0,000*	-0,000**	0	0	0	0
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
RS^3	0,000**	0,000***	0	0	0	0
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
Sex	0,027***	0,027***	0,010***	0,009***	-0,022***	-0,022***
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
Area	-0,019***	-0,014***	0,015***	0,014***	-0,002	-0,003
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
Private high school		-0,037***		0,013**		0,011*
		(0,01)		(0,00)		(0,00)
Public high school		-0,044***		0,009*		-0,017***
		(0,00)		(0,00)		(0,00)
Between 15 and 30 minutes		-0,011***		0,007**		0,005*
		(0,00)		(0,00)		(0,00)
Between 31 minutes and 1 hour		-0,018***		0		0,018***
		(0,00)		(0,00)		(0,00)
More than one hour		-0,003		-0,015**		0,016***
		(0,01)		(0,01)		(0,00)
Number of household members		0,010***		0		0,004***
		(0,00)		(0,00)		(0,00)
Mother: basic education		0,015**		0,014**		0,018***
		(0,00)		(0,00)		(0,00)
Mother: baccalaureate or technical		-0,025***		0,021***		0,022***
		(0,01)		(0,01)		(0,00)
Mother: higher education		-0,032***		0,015**		0,003
		(0,01)		(0,01)		(0,00)
Constant	0,564***	0,562***	0,100**	0,101*	0,139***	0,127**
	(0,05)	(0,05)	(0,04)	(0,04)	(0,04)	(0,04)
N	170674	170502	171236	171081	86033	85941
R^2	0,011	0,013	0,003	0,004	0,011	0,014

Note: t statistics in parentheses; * p<0.05, ** p<0.01, *** p<0.001

Source: AFS 2017.

Elaboration: the author

RDD reduced form for non-cognitive outcomes (complete) (continued)

	Esteem-Lang (1)	**Esteem-Lang** (2)	**Esteem-Sci** (1)	**Esteem-Sci** (2)	**Esteem-Soc** (1)	**Esteem-Soc** (2)
Below cutoff point of 28.2	-0,012	-0,013	0,003	0,002	-0,007	-0,008
	(0,01)	(0,01)	(0,01)	(0,01)	(0,01)	(0,01)
RS	-0,009**	-0,010**	-0,010**	-0,010**	-0,012**	-0,013***
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
RS^2	0,000*	0,000**	0,000**	0,000**	0,000**	0,000**
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
RS^3	0	0	0	-0,000*	0	-0,000*
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
Sex	0,063***	0,062***	0,032***	0,032***	0,033***	0,032***
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
Area	0,002	0	0,003	0,002	-0,003	-0,004
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
Private high school		0,004		0,005		0,005
		(0,01)		(0,01)		(0,01)
Public high school		-0,010*		-0,025***		-0,014**
		(0,00)		(0,00)		(0,00)
Between 15 and 30 minutes		-0,001		0,008**		0,005
		(0,00)		(0,00)		(0,00)
Between 31 minutes and 1 hour		0,011***		0,020***		0,024***
		(0,00)		(0,00)		(0,00)
More than one hour		0,017**		0,020***		0,015*
		(0,01)		(0,01)		(0,01)
Number of household members		-0,001		0,002		-0,002
		(0,00)		(0,00)		(0,00)
Mother: basic education		0,014**		0,018***		0,015**
		(0,00)		(0,00)		(0,00)
Mother: baccalaureate or technical		0,026***		0,022***		0,01
		(0,00)		(0,00)		(0,01)
Mother: higher education		0,024***		0,013*		0,015*
		(0,01)		(0,01)		(0,01)
Constant	0,211***	0,218***	0,208***	0,207***	0,283***	0,294***
	(0,05)	(0,05)	(0,05)	(0,05)	(0,05)	(0,05)
N	86023	85931	86031	85937	86035	85942
R^2	0,012	0,013	0,013	0,014	0,009	0,01

Note: t statistics in parentheses; * p<0.05, ** p<0.01, *** p<0.001

Source: AFS 2017.

Elaboration: the author

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Notes

[1] As stated by Gary Becker, human capital accumulation is the result of investments in training and education (Becker 1993).

[2] This term has a limited scope because it values children for their future role as adult workers where their effort is translated into investment returns that will be used for economic growth (Palacio 2016). Instead, the term that should be used is human capabilities development which is more related with well-being goals.

[3] Ability to choose or create environment suitable to his or her psychic conditions (Ryff and Singer 1996).

[4] Having strong feelings of empathy and affection for others (Ryff and Singer 1996).

[5] According to Bandura (1997) the sources that improve self-efficacy are mastery experiences, social models, social persuasion and emotional and psychological states modifiers.

[6] Acceptance of one's self and one's past life and Positive attitudes towards oneself (Ryff and Singer 1996).

[7] A sense of directedness and intentionality about of life´s purpose (Ryff and Singer 1996).

[8] Continue to develop one's potential to grow and expand as a person (Ryff and Singer 1996).

[9] Ryan and Deci (2000) proposed the self-determination theories where they distinguish the intrinsic and extrinsic motivations. Intrinsic motivation is more an internal process and it refers "to doing something because it is inherently interesting or enjoyable"; in this case rewards are internal (self-satisfaction) and they drive individual's behavior (Ryan and Deci, 2000: 55). On the

other hand, extrinsic motivation is regulated by external rewards (or punishments), which constitute external reinforcements. Extrinsic motivation "refers to doing something because it leads to a separable outcome" (Ryan and Deci 2000: 55).

[10] BDH conditionalities are called "co-responsibilities" are publicized as mandatory (see https://www.inclusion.gob.ec/bono-de-desarrollo-humano1/) but there is not a standardized procedure for the verification of conditionalities, therefore they are "soft conditionalities" (Mideros and Gassmann 2017:10). However, there is evidence that some beneficiaries think they are being tracked (Martínez et al. 2017).

[11] Buen Vivir is an ancestral Kichwa worldview, conceived as a style of life where an individual meets their needs with quality of life, coexistence in community, in peace and harmony with nature and human cultures (National Secretariat of Planning and Development 2013).

[12] The educative system is structured with thirteen study levels. The first ten levels are part of the Basic education whereas the last three years are classified as the *Baccalaureate* or Middle education which is equivalent to the secondary (superior) level according to the International Normalized classification of Education (Ministry of Education of Ecuador 2015:25).

[13] The model of evaluation on which the survey relies is based in the associated factors with the learning process. In this model the centre is student's learning and contemplates the development of knowledge, skills and attitudes that will contribute to the development of a society. Additionally, the model considers that student´s learning is influenced by different actors, spaces and times determined throughout his life. The main components of this model are student's context, life trajectory, educational outcomes and educational impacts. These components are measured and evaluated in Ecuador by the National Institute of Educative Evaluation through the Ser Bachiller exam and the AFS (National Institute of Educative Evaluation 2016).

[14] For administrative reasons, the data on the National Social Registry was not available for this research, however, the available data about the students' characteristics was good enough to replicate the RS score.

[15] The age frequency showed a range from 10 to 59. The valid age range was selected based on the higher frequencies that is, from 15 to 19.

[16] The original RS weights and methodological procedure are part of a non-published methodological note from the Office of Information, Analysis and Evaluation of the Social Sector in the Ministry Coordinator of Social Development around 2014.

[17] ISEC stands for "Socioeconomic index" is a composed welfare index calculated by INEVAL that includes: education level of parents, student's ethnicity and a set of goods and services of the household (National Institute of Educative Evaluation 2016:177).

[18] The RS index is a source of exogenous variation that determines the treatment status and therefore, it will be used as a forcing variable.

[19] In the Fuzzy RDD the probability of being treated does not changes from zero to one at the cutoff point (Imbens and Lemieux 2007). The fuzzy design exploits the discontinuity on the probability of being treated by using it as an instrument to explain the treatment status. This dynamic was explained by Angrist and Pischke (2008) who describe the probability of being treated as:

$$P[T_i = 1|x_i] = \begin{cases} g_1(x_i) & if\ x_i \leq x_0 \\ g_0(x_i) & if\ x_i > x_0 \end{cases}, \text{ where } g_1(x_i) > g_0(x_0)$$

Where T_i is the endogenous treatment status; $g_0(x_i)$ and $g_1(x_i)$ are functional forms that differ at x_0 (the cutoff score). The expression means that beneficiaries (T=1) have a probability of treatment described by function $g_1(x_i)$ when their RS score is lower than 28.2 while non-beneficiaries have a probability of treatment function $g_0(x_i)$ when they have a higher RS score.